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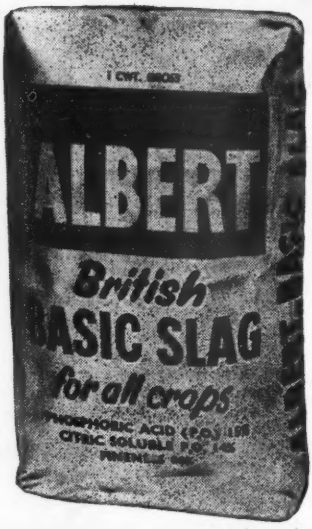

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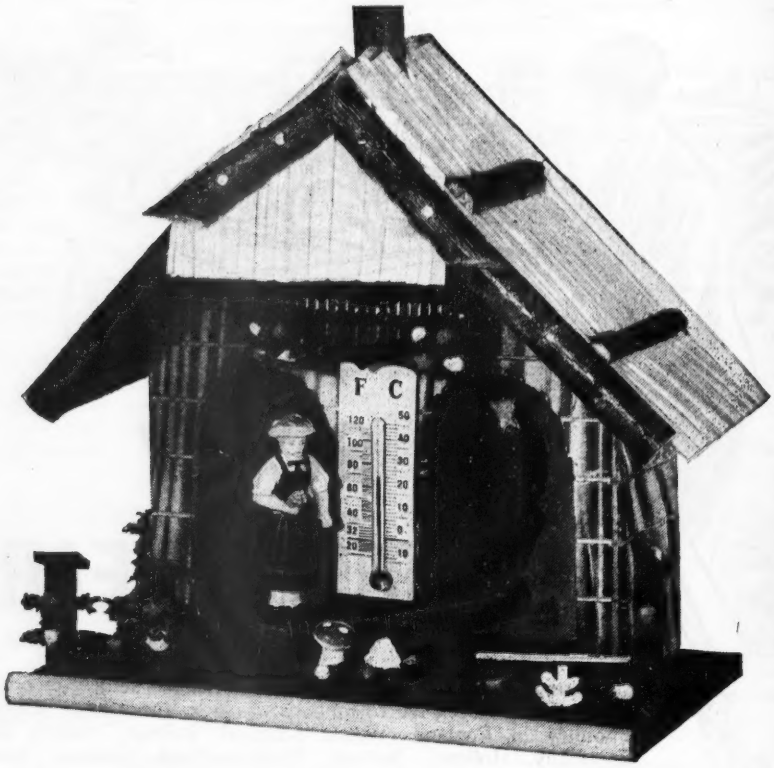

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Agriculture

Volume 68 Number 10 January 1962

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Why Plan?

H. BURR, M.Sc.

National Agricultural Advisory Service, Eastern Region

This article is the first of a new series on farm management. It stresses the importance of calculating gross margins for each of the individual enterprises on a farm before attempting any re-planning of the existing system.

How far in farming—or in any other walk of life for that matter—is it possible to plan for the future? If we had all kept records over the past twenty years of our prognostications about the fate of agriculture I doubt if we should have been right more often than wrong! Is it ever going to be possible to forecast what "they" (that is, the housewives, the butchers, the Government) will want in a few years time? Many farmers have plagued themselves trying to find answers to questions like these, and in the end have decided that their best insurance lay in doing what they were doing as well as they knew how and letting the future take care of itself.

Over the past twenty years this hasn't, as things have turned out, been a bad policy, because expanding markets and Governmental price regulation have ensured a fairly even balance of profitability between products. There have, of course, been exceptions. Beef throughout that period has never been competitive with other livestock products, and on small farms the choice of enterprises has always had to be made with emphasis on intensity of production. Exceptions apart, however, most farmers have been able to maintain and improve their incomes by increased technical efficiency without having to resort to any major changes of system.

There are signs that we are moving away from this state of affairs. Not a few farmers are finding that systems which until recently have stood them in good stead are showing declining profit levels year by year. This is not because they are any worse husbandmen, but rather because markets are changing, price relationships between commodities are altering, and some costs, notably of labour, are rising rapidly. In circumstances like these—and there are, I fancy, more than we yet know of—farmers are no longer interested in answers to the question "why plan"?—they are asking "*how*"?

To all our readers—

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Which enterprises pay?

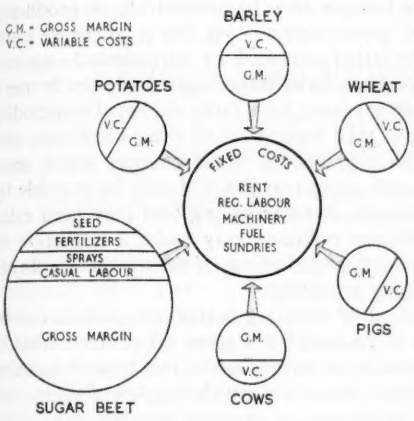
What have we to offer them? It is, I think, well known that over the past ten years we in the N.A.A.S. have been involving ourselves more and more with the business implications of farming. We have relied heavily on annual tax accounts as our source of information and our diagnosis of weaknesses, and suggested improvements have all reflected the character and the limitations of this main source of our information by laying emphasis on the "whole farm" as being the important unit. Changing farming circumstances don't make this concept any less valid. In the end, a farmer is interested in the income from his farm as a whole, for it is by this he lives and only by this can he make a final assessment of the return he is getting for the capital he has invested, the skill he puts into farming and the risks he takes. But this must not be allowed to disguise the fact that under the surface of this "whole farm" concept there are, on any farm, the individual enterprises, each competing for a share of capital and services and each contributing to farm income. It is now becoming vitally important that we should have a method of taking the farm to pieces to see which bits pay—to be able to determine when profits are low whether one or two commodities are pulling the rest down or whether the whole system is in second gear.

Attempts to dissect out the productive parts of a farm business have in the past been largely confined to cost accountancy, a system involving extensive records of output and costs and considerable arithmetical dexterity in allocating all the costs of the farm to the various production lines. Most farmers who have tried this method have quickly abandoned it as being too costly and—more important—actively misleading in some circumstances because the profitability so judged of one product compared with another depends on a rather arbitrary allocation of overhead, or "fixed", costs. For these reasons, at several centres, the economists and the N.A.A.S. have been engaged in evolving a system of farm analysis and planning which would overcome the objections to cost accountancy, would recognize the importance of the "whole farm", and yet enable a farmer to take his business apart and reassemble it in the most profitable combination of the land, labour and capital at his disposal.

Fixed costs and gross margins

Details of systems which have been evolved have been given in *Agriculture* recently [1] [2], with examples of how economic information can be manipulated. All these systems, with their variations of detail, are based on the concept of a farm business having two main parts. This is illustrated in the diagram on page 519 in which is shown a central core of overheads or *fixed costs*, the costs which have to be borne by the "whole farm". It may be a little misleading to describe these costs as fixed, for no farm costs are unalterable, but they are characterized in three ways. They remain fairly constant unless relatively large changes are made in the farming system; the items involved cannot be bought in small amounts and usually their cost runs on whether or not you use them; and they are the costs which cannot easily be allocated to the various lines of production.

Arrayed around this core of fixed costs we have the productive enterprises of the farm, each responsible for a certain volume of *output* and each attracting



certain *variable costs*—so called because they vary in direct proportion to the size of the productive unit. The difference, for each commodity, between the output and the variable costs is its *Gross Margin*. This is a simple calculation in respect of cash crops—in fact, most farmers are able to provide the information needed from simple records or from memory. The animal enterprises which make no use of fodder crops are also easy to deal with, but grazing livestock presents problems. My feelings at the moment are that, unless it is possible to make an accurate allocation of fodder crops (including grazing) to specific types of livestock, it is best to treat the fodder area as a unit within which a modified sort of gross margin per animal can be calculated for each type of stock using fodder.

Having calculated gross margins, what can we learn about a farm? First, we get a very good measure of the technical standards being achieved, for the gross margins on the farm can be compared with easily prepared *standards* for any locality or type of farming. This simple comparison may highlight technical deficiencies, the correction of which may be all that is necessary to improve profitability. This Journal will be carrying over the next few months a series of articles dealing with particular commodities, setting standards of reasonable performance and suggesting ways in which these can be achieved. The checking and adjustment of existing farm systems in this way is an important preliminary to any attempt at re-planning.

There will, however, be many farms on which these simple adjustments are insufficient to bring farm incomes to a reasonable level. Here again, the commodity gross margins are the starting point for fresh thinking. The total gross margin for the farm is, unfortunately, far from being synonymous with farm income, for it first has to pay off all the *fixed costs* and only after this has been done can the farmer's real income be assessed. It is clear, therefore, that income depends on the *relationship* between gross margin and fixed costs; if income is low this ratio is wrong and planning must start from here. A very good yardstick is that fixed costs should not absorb more than two-thirds of the gross margin, thus leaving one third as farm income. If they do, then re-planning must aim either at increasing gross margins or reducing fixed costs—or perhaps a bit of both.

Planning the farm system

When lists of gross margins are published, it is always obvious that cash roots like potatoes (£65 an acre) and sugar beet (£60) contribute more to gross margins than wheat (£30) and barley (£25). Similarly dairy cows (£30 an acre) are better than single-suckled beef (£13). It sounds like an over-simplification

to say that, in re-planning, all we have to do is to concentrate on producing the commodities with the highest gross margins—yet this is where we start. Many obstacles will have to be either accepted or surmounted—quotas, husbandry considerations and, perhaps most important of all, the farmer's own preferences—but it is not until you have, for a farm, the list of commodity gross margins that you can start to take account of all these conditions and work them into a manageable farming system. Some changes which seem desirable as a result of juggling with gross margins will only be possible by changing the fixed costs—for example, cows replacing beef may need extra fixed equipment; or cereals replacing potatoes may make a reduction of permanent labour possible—but the financial effects of these adjustments are calculated quite easily as re-planning proceeds.

One of the virtues of this method of planning is that the process can be played in reverse. In this way it is possible for a given set of fixed costs to work out the farming system most likely to be profitable. This type of planning is becoming more and more important in areas in which supplies of permanent labour are declining. A system which makes the best possible use of the available labour then becomes the desirable objective.

Our experiences so far with the use of these techniques encourages us to hope that they will become increasingly useful to farmers and advisers. We all still have a lot to learn in this field, but already I think I can pass on a few hints to the unwary. First, the system must suit the farmer. If you are a farmer this means that, when re-planning, you must be honest with yourself and not take on something more demanding than you are willing or able to meet. If you are an adviser it means, equally, that you need to be just as shrewd a judge of man as you are of bullocks. Next, the future must be planned on the basis of present performance. If you have to use estimates, make them conservative. If time proves you a pessimist you will at least have the consolation that the plans you have made are more lucrative than you expected. Then, in your enthusiasm for planning, don't forget good husbandry. A system which gives good results for a year or two and then breaks down completely is no good to anybody. So remember husbandry—but don't be hidebound! Remember, too, that rotations, or crop sequences, must be evolved as part of the plan. I have seen in the literature quite a few theoretical efforts at profit maximization by the use of gross margins which end up by suggesting a cropping pattern which would be impossible to follow for more than one year. Make sure you haven't got a plan in which the labour needed to plant winter wheat is simultaneously needed to harvest sugar beet off the same land!

I have suggested that two things determine profit—what you do and how well you do it. Both are important, and there are still extra profits to be gained through improved technical efficiency. My feeling, however, is that the greater potential lies with the better planning of our resources, so that each farmer concentrates on doing the things he does well. These, in any event, are usually the things he likes doing.

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Stillage Handling of Potatoes

F. H. WATTS and J. G. MILSOM

National Agricultural Advisory Service, Essex

With less farm labour, the advantages of stillages for handling and storing must appeal to every potato grower

THE development of stillages for handling the potato crop after lifting began in Essex in 1954. Today it has spread to many of the main potato-growing areas, and interest continues to grow as its many possibilities are assessed.

Essex is a county of mainly heavy land—land which the outsider would consider most unsuitable for this crop—and a county of intensive arable farming. Hence if the potato was to survive as an economic crop, means had to be found of mechanizing the harvest and reducing the labour demand. Many types of potato harvester have been tried, but few have been found very suitable for soil conditions met year in year out. It was with the failure of the complete harvester that a search for alternatives came about, the most promising being the stillage method.

The stillage is basically an adaptation of the pallet system, where a container or box is so made that it can be handled mechanically by existing, or slightly adapted, tractor equipment. Several types exist, but for ease of explanation we shall first deal with the system now widely adopted, and then mention the variations which have developed with experience.

To harvest and market the potato crop, all growers are faced with the following:

1. The removal of the crop from the ridge with the minimum damage.
2. The collection of the crop into containers for removal to store.
3. Transportation to store and storage with the minimum possible use of regular skilled labour.
4. The elimination of physical effort and heavy lifting.
5. The storage of the crop under the best possible conditions.
6. The prevention of damage to a crop where losses through handling damage alone have been estimated at half a million tons annually.

Admittedly, the harvester accomplishes 1 and 2 where working conditions are suitable, but subsequently all growers, no matter how they harvest, are faced with the same problems.

Five-cwt stillages in operation

Under most Essex conditions the spinner or the elevator have proved themselves efficient lifters. The introduction of 5-cwt stillages has gone a long way towards overcoming the limitations of many traditional systems, as will be seen by an explanation of this in practice.

Where no complications occur, such as long distances from field to store, two 5-cwt stillages are needed per picker. In practice a few extra are provided, usually 30 for a 12-14 picker gang. When lifting starts, the stillages are set equi-distant down the field a few rows in the crop from the lifting face. Experience has proved that it is usually easier to work from one side of the

field only. Once the field has been opened up, they are placed on the lifted ground as close as possible to the picker. The picker picks into a basket or apron, then empties into the 2½-feet-high stillage. As the pickers are paid on the number of stillages filled, it is unnecessary to mark out individual stints, since fast and slow workers tend to sort themselves out so as to get the maximum throughput each per day. For efficient working the picker must not have to walk further than necessary, and in light crops it may be necessary to move the stillage forward before it is full. This is accomplished by the use of the tractor fore-end loader.

Once filled, three 5-cwt stillages can be carried by a standard tractor to the store, two stillages on the double rear-end lift and one on the fore-end loader. Once at the store, they are lifted and tipped by a modified fore-end loader (a tipler) over a spill-board direct into heap. The spill-board is a simple device for retaining the potatoes in place. Where hauls are long, farm roads poor, or field conditions very difficult, transport may have to be varied by conveying stillages to the store on trailers or emptying the stillages into trailers in the field for subsequent emptying into an elevator at the store.

Thirty to forty tons per day can be lifted and stored by the first method. This needs 30 stillages, 2 tractor drivers, and a gang of 12-14 pickers working 5½ hours per day. The two tractor drivers, who will be regular farm workers, operate the spinner and the stillage transport tractor. Neither operator need leave his tractor seat, and the whole operation of lifting and storage is accomplished by these two regular men and the small gang of casuals. The only physical effort involved is that of emptying the picking container into the stillage. Casual workers prefer the system, and assessment of earnings is easy, as the transport tractor driver records each picker's filled stillage as he collects. This system saves approximately 50 per cent of the regular labour hours usually devoted to harvesting by traditional means, and in addition the pickers' efficiency is considerably increased.

The original fore-end tipler developed in Essex was designed to tip sideways. A modification now exists using stillages with either 5 or 8 cwt capacity which are tipped forward. Both give satisfactory service, the method of use being basically the same.

Dual-purpose: carry and store

A more recent development, which is dual-purpose, uses the stillage for conveying and crop storage. This makes use of a 10-cwt container. Lifting procedure in the field is similar to the 5-cwt, but because of strain on the tractor front axle only one stillage is conveyed by the tractor to store at a time, this being on the rear-fork lift. Although 5 cwt less is carried on each journey, provided the field-to-store distance does not exceed half a mile, no loss of efficiency occurs. This is because time is saved during emptying or stacking and in field collection.

The conveying tractor driver's method of working is to deposit his first loaded stillage at the store and return to the field for a second. On returning to the store with the second filled stillage on his rear lift, he engages the first stillage with his front lift, lifting it for either stacking or emptying over the store spill-board. The loaded stillage on the rear lift, which has acted as a counterweight, is then dropped off to be lifted into the store on the next journey.

Only limited experience of storing the crop in these larger stillages yet exists. There is, however, enough to justify the extension of the practice. No expensive reinforcement of walls, air ducting or insulation are necessary. In fact almost any type of general-purpose building of suitable height and floor space can be used, provided it can be made light- and frost-proof. Filled stillages can be stacked 10-12 feet high with standard fore-end lifts and to 15 feet if telescopic rams are fitted.

Stored in stillages, air can circulate freely through the bulk of the crop, since the depth of potatoes never exceeds 2 ft 6 in. Evidence last season (1960), when the crop was lifted wet with much soil, showed no problems. In fact, the crop dried out quicker than in bulk store and rots failed to spread.

By emptying the stored stillage directly on to the grader, the system has the great advantage that the potatoes (subsequent to the pickers' handling) are not handled physically until they are sacked off the grader. If the full sacks are then stacked on a pallet, physical lifting is again almost eliminated. Also when crops are sent for pre-packaging the full stillage can be loaded on to a conveyance and on reaching the plant tipped direct into it. By reducing handling in this way, damage is kept to a minimum; the potato fork, the cause of so much harm, is discarded; and physical effort virtually eliminated.

Stillages up to 1-ton capacity are being developed. These appear to be of very limited use except under ideal field conditions, because their weight when full means they must be conveyed on a trailer or lorry, and their handling needs relatively expensive specialized fork-lift equipment.

An idea of cost

For a farmer considering the 5-cwt stillage system, the necessary capital costs are:

	£	*s.*	*d.*
Thirty 5-cwt stillages at £3 (farm made)	90	0	0
Fore-end tipler attachment to existing loader	85	0	0
Rear-lift attachment, lifting two stillages separately	39	10	0
Spill-board for controlling potato height when tipped into store (usually farm made, but say)	20	0	0
	£234	10	0

These figures are based on the assumption that a fore-end loader and a picking gang are already available, and the haul does not exceed $\frac{1}{2}$-$\frac{3}{4}$ mile.

This system was adopted during the 1961 season by the N.A.A.S. at Bridget's Experimental Husbandry Farm, near Winchester. Some 50 acres of potatoes are normally grown, and capital expenditure was in line with the example above. Comparing harvesting costs with previous years, the following direct savings occurred:

	£	*s.*	*d.*
Wages of 2 men for 16 days	51	9	4
Overtime saved	59	5	6
Sack replacements each year	38	15	0
	£149	9	10

When stillages are used for storage, the number needed must be relative to the yield expected. These larger 10-cwt stillages cost about £5 per ton

for materials stored. The practice at present adopted by growers changing to this method of storage is to provide sufficient in one year for only a proportion of the crop. Capital costs are thus spread, and also the problem of replacement. The working life of these larger stillages is not known, but is expected to be more than seven years. This figure is based on experience with the smaller sizes, many of which have now seen seven seasons' continuous work, with very little deterioration. With the continued decline in regular farm labour, the stillage system, both for handling and storage, holds out great possibilities. The day of highly-paid staff carrying out heavy physical work is fast disappearing, thanks to mechanization. We must continue to devise means of maintaining this trend, using the machine to its full capacity.

Conclusions

To sum up, therefore, handling and storage in stillages has obvious advantages, in that:

(1) the potato is handled only once at harvest time, when it is in the "soft skinned" condition. It is at this time that damage is most likely to occur;

(2) heavy physical labour is eliminated;

(3) regular farm labour is left free for the seasonal work of sugar beet harvest and corn drilling, allowing a greater acreage to be sown to winter cereals under better conditions;

(4) the depth of potatoes in store never exceeds 2 feet 6 inches. Air can circulate freely and the crop dries out quicker and more evenly. Evidence, to date, suggests that rots fail to spread so readily, and losses are reduced.

The direct savings from 1, 3 and 4 could well offset the additional capital required in changing over to this method.

The End of a Beginning

D. R. COLDWELL, N.D.A.

National Agricultural Advisory Service, Gloucester

An account of a Pilot Farm Scheme which enabled a Gloucestershire farmer, with the advice and help of the N.A.A.S. and economists from Bristol University, to increase productivity and profits.

WHEN economist, farmer and adviser combine to plan a farm, the sceptics may well smile, but this is precisely what Mr. Hall, of Field Lane Farm, Cam, Gloucestershire, and the N.A.A.S. did in 1954. This was the beginning of a Pilot Farm Scheme which aimed at planned farming to increase profit by combining good practical methods with sound technical and economic advice.

We first discussed the possibilities involved in the selection of a pilot farm in 1954 and the use it would have in illustrating advisory matters and policy changes which might occur. In this year, these 88 acres were in a low state

of fertility—not capable of carrying more than 20 cows. Today the same acreage is carrying 40 cows, followers to 1 year old, together with 5 acres of potatoes.

The farm itself is in the Severn Vale, standing with its back to the Cotswolds escarpment and its feet on the Bristol-Gloucester road. The steading is in the middle of the holding, which is long and narrow in shape. The top fields have an outcrop of limestone, with no drainage problem. Below this an outcrop of a sandy loam forms an acid strip across the farm, and below this again the fields are of lias clay which is heavy, cold and, in this case, wet in places.

As with many farmers at the outset of their career, the shortage of capital was matched by the need for profit, and these two factors provided the outline within which any plan had to be formed. Mr. Hall was able to start by buying some twenty old cows from the Normead herd. These were known to be of an exceptional milking strain and they fulfilled their early promise, providing the base for a sound stock policy. At first the overall policy was largely dictated by this capital shortage and the poor grass which prevented him from buying more cows and so producing a greater output of milk sooner. Unfortunately there were only 20 stalls in the cowshed which also limited the cow numbers.

To create capital initially and use land not needed for the dairy herd, cash cropping in winter wheat and potatoes was introduced. The heavy ground was improved with slag and grazed by a ewe flock, and most of the dairy heifers were reared for replacements. It was intended to keep a few sows in a quarry and some layers in a loft as sidelines to provide extra income without much additional capital. By 1956-7 this pattern of extremely mixed farming had crystalized so that 4 acres of potatoes and 11½ acres of wheat were grown and the first of the home-bred heifers were coming into the herd. This meant that the second and main aim of the plan was to be carried out. This point produced a radical change in the farm output and was followed by a significant increase in production.

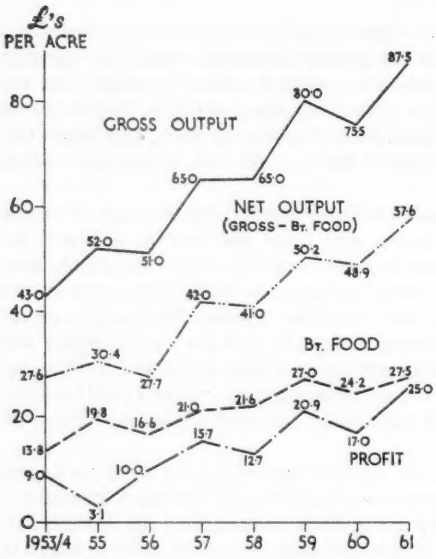
Second stage

The heifers had been put out on to another farm under an ingenious arrangement by which they were kept during the time they were in calf (to an Aberdeen-Angus) and weighed just before calving. The cost of keep was related to liveweight gain and the grazier was paid £8 per cwt with the option of buying back the calf for £5. The effect of this friendly arrangement was that the acres they might have occupied at Field Lane Farm were released for extra cows at a cost per replacement of about £9 per cwt liveweight gain—a better proposition than most beef enterprises for the grazier.

Considerable use has been made of Italian ryegrass and timothy-fescue leys to build up the available grass which was necessary to support the increased stocking rate. By improved cultivations and increased use of fertilizers, the potato and corn yields have been average, and the grass crop has increased as the proportion of good leys went up. About 7 acres of land remain in permanent grass, but even these have been improved with slag and sheep grazing from a few store lambs overwintered.

Because of the shape of the farm, it was difficult to make the best possible use of the grass crops by cow grazing or for conservation until the advent of

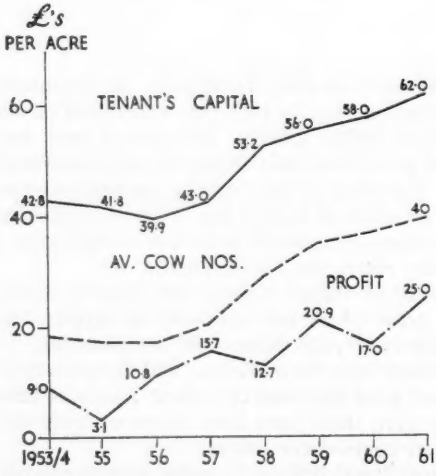
Field Lane Farm



1959-60 SEVERN VALE	
GROSS OUTPUT	57·2
NET OUTPUT	38·1
BOUGHT FOOD	17·9
PROFIT	9·6

Fig. 1.

(Cows written down in value in 1955)



1959-60 SEVERN VALE	
TENANT'S CAPITAL	£53·1
COWS (at same rate per acre)	£25
PROFIT	£9·6

Fig. 2.

(Cows written down in value in 1955)

the forage harvester enabled even the furthermost fields to be brought into the cow acres, a factor of great importance once the numbers increased sharply.

The improved fodder quality brought about by the use of the harvester was not so much a question of the actual analysis but that more of the available grass was conserved as silage and less for hay. This greatly improved the winter feed position and thus enabled the increased number of stock to be carried. The part that grassland had to play is best illustrated when the net production figures are considered; it will be seen from Fig. 1 (opposite) that these have risen steadily from the outset.

Basically the problem was first to produce more capital and then to deploy the capital to the best advantage.

Conclusions

The lessons to be learned from this pilot farm exercise are applicable to many dairy farms:

(*a*) Cash cropping in the early stages of a farm plan should be used to finance the build up of high quality stock.

(*b*) By improving the quality and increasing the tonnage of food available, a high stock-carrying capacity is created, which reflects in the net output, i.e., gross output less food bought.

(*c*) In order to exploit grassland fully a heavy rate of stocking with cows is required.

(*d*) Profit is closely related to net production, and any long-term planning should be designed to produce a high net output and increased profit margin.

(*e*) A wide profit margin gives a greater allowance for contingencies and provides the further capital required for expansion (see Fig. 2).

Mr. Hall has now reached the end of one of what I hope to be many successful phases of his farming career. He is leaving Field Lane soon to take a larger farm in the county.

We in the N.A.A.S. owe a great debt of gratitude to Mr. Hall for allowing us to use his farm in this way and to publish the financial results; also for allowing us to tell of experiences gained when guiding a farm through the difficult period of establishment until it grew into a sound enterprise. I would also like to acknowledge the help received from the Bristol University Department of Agricultural Economics.

Commercial Sweet Pea Growing

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The growing of sweet peas on a commercial scale calls for much skill and careful preparation and handling at all stages.

THERE are a number of risks involved in growing sweet peas as a commercial crop, not the least of which is the effect of prevailing weather conditions. Lack of sunshine will equally influence results, both under glass and out of doors, and the grower must use all his skill to raise good quality produce as early as possible and throughout a long season. Best quality is obtained from cordon-trained plants, but this method is extravagant in labour requirements and, as a result, the acreage has decreased since 1939. Sweet peas have received far less attention from the research workers than many other crops, and much less than they deserve. The fact that it is possible to produce a winter crop under glass from December onwards suggests that artificial illumination may be of direct value but, while a few preliminary investigations have been made, nothing tangible has as yet developed.

Popular demand requires flowers with long stems (12 to 14 inches) carrying at least four blooms. For this type of vigour it is essential to grow the plants as cordons on strings or canes, rubbing-out all laterals and tendrils and so encouraging the whole of the plant's energies towards the production of flowers. The alternative method of growing on brushwood hedges prevents such severe pruning. As a result, many more flowering stems are produced, but of less vigour and size.

Specialists continue to grow a large area of cordon peas under glass, and a few of these produce a winter crop. The winter-flowering varieties, of which Avalon (blue), Snow Queen (White) and Fire Wagon (scarlet) are typical, produce small flowers on short thin stems—frequently only two blooms on a stem. While of some economic value, they cannot yet be recognized as a basic crop likely to produce an annual profitable project.

Success is undoubtedly easier to achieve from a crop flowering from as early in April as possible to some time in June, when it meets with outdoor production. The days have lengthened and light intensity increased. While this, too, may be a specialist's crop, it is also well suited to the smaller mixed nursery. Inter-planted with lettuce, sweet peas can be accommodated in cold structures, static houses, or mobiles, or inter-cropped with a variety of salads which do not hinder production but enhance the total income of the area. Investigations at Efford Experimental Horticulture Station between 1956 and 1958 provided gross market returns of £2,412 for sweet peas and £643 for lettuce—a total of £3,055 per acre. It is doubtful whether the presence of the lettuce affected the returns from the sweet peas, while itself being responsible for more than £600.

Early production is not so easy to achieve in northern areas, although I remember tending a glasshouse crop in full production in late April at Houghall, Durham, in 1927. Both Cuthbertson and Spencer varieties are

suitable for this period. Carol, Joy, Astrid and Peggy represent the former, while Gigantic, Mrs. C. Kay, Air Warden, Welcome, Mrs. L. Bolton, Patricia Unwin and Carlotta are all good Spencer varieties.

Preparing for glasshouse crops

Seed should be sown from early September to mid-October. Compost should not be too rich and J.I. No. 1 is ample. As sweet peas resent root damage when transplanted, seeds are best sown singly in small 60s and germinated at 55 degrees. Plenty of light, with cool buoyant conditions, is necessary for the young seedlings until ready for planting out in early December. Over-watering of the seedpots should be avoided, especially of light-coloured seeded varieties, as there is evidence that these are susceptible to damping in the germinating phase. While sweet peas undoubtedly succeed where they have easy root penetration, there is no necessity for the extremes of deep cultivation formerly practised when labour was cheap. A freely-drained soil, with pH 6·5–7·0, is the first essential. Cultivation to a depth of 20 inches is desirable but invariably involves some manual work. Where ploughing is possible, less than this must suffice, provided the subsoil is of an open nature or can be mechanically disturbed. As the plants will be set out in rows running the length of the house or structure, trenches only need be prepared, sufficiently wide to accommodate double rows. Farmyard manure should be incorporated during cultivation at the rate of 40 tons per acre. This application must be adjusted according to the treatment of the house for the preceding crop, and much less will be satisfactory if tomatoes or cucumbers have been grown previously. It is often possible to see the effects of a high pC content, and a generous flooding of the houses should be considered.

A base fertilizer dressing, consisting of 2 oz hoof-and-horn, 4 oz superphosphates and 2 oz sulphate of potash per square yard is necessary. It is essential to limit nitrogen at this stage and to apply it when the plants are growing away towards full establishment. The availability of nitrogen is closely related to "bud-drop". A vigorous, lush plant may have a low carbohydrate-nitrogen ratio, the nitrogen level being high in relation to the carbohydrate or sugar and starch supply. This is an undesirable condition and should be prevented, especially in the early part of the year. Being leguminous, the plants will develop nodules during their early life in the absence of ample nitrogen, but as applications are gradually stepped up, a larger and finer root structure is encouraged while nodulation decreases.

Strong-growing plants are more prone to bud-drop and every effort must be made to develop a balanced carbohydrate-nitrogen ratio. Investigations by N. G. Smith, M.Sc., Department of Botany, Manchester University, into the relationship between calcium levels and bud-drop show that ¼ oz chalk given to each plant at planting time and repeated when the first flower buds appear increases the rate of growth and flowering to an appreciable degree. Smith also confirmed what has long been known in practice that over-generous watering may be harmful unless drainage is absolutely ample and free. Hence largely the necessity for deep cultivation and the incorporation, when available, of old mortar rubble with the soil.

During periods of dull weather, watering, either under glass or out of doors, should be drastically reduced or even temporarily suspended, but not without careful checking of the subsoil to prevent complete drying out.

There is less risk of bud-drop after the middle of May, when the light intensity and day-length has improved, and nitrogenous applications can begin. Water supplies should be increased at this period to encourage stem length, and nitrogen and potash can be given at the same time by combining nitrate of potash and sulphate of ammonia in solution. There is a strong case for the use of trickle irrigation for sweet peas, and prepared trenches give some encouragement to this method.

Distances can and do vary slightly with circumstances, but 6 inches between the plants within the row is the minimum. Double rows are desirable, with at least 12 inches between them. The rows should run the length of the house, and the alleys between the double rows should not be less than 30 inches—although inter-cropping demands wider spacing. Care should be taken when trowelling-in the plants to prevent the roots being tangled and bent. Lay them in to their full depth with the least possible disturbance.

Supporting and training

While 6-feet bamboo canes are ideally suited as supports, economics demand the use of thin, strong string in commercial glasshouses. String is not desirable outdoors because of wind and general weather conditions. Strings anchored to horizontal wires at soil level and at the 6-feet level give fair support. Light broken metal rings enable the plant to be attached to the string quickly and efficiently, and have the added advantage of being easy to remove and release when the plants are taken down and layered.

It is worth layering before the plants come into flower, so that flowering then commences from the base of the strings. This completely eliminates crooked stems, and permits the maximum interval of flowering before layering again becomes necessary. Extreme care is essential not to crack the stems when lowering the plants from the strings, and this is best done before watering while they are less turgid. It is customary to remove the primary shoot, and all but the most vigorous basal shoot, at planting time, and to tie-in the remaining growth to form the cordon. All laterals and leaf tendrils should be removed from the cordon as soon as they are seen.

During the first few weeks 40-45° F as a night temperature will serve as a useful guide, gradually increasing to 50-55° F as day-length develops. There is little need to check day temperatures, but maximum ventilation should be given whenever possible. Cool growing should be the aim.

Cutting and marketing

As there is little or no development of unopened buds after removal from the plant, it is essential to delay cutting until the optimum moment. This is usually just as the topmost flower begins to expand but some time before the lowest flower has passed its peak. They must be cut at early morning while cool, and bunched immediately before placing in water pots. The stems must be straight and flowers graded for colour and blemishes. Twelve stems make a bunch, arranged in a rectangle of four rows of three stems. Short stems can form the lowermost row and two small rubber bands used to secure the bunch at two places. Twelve bunches in four rows, two rows either end, form a market package. Black, off-white or pale blue paper is used for lining the box, but pale blue is most useful when packing more than one colour in a box. Mixed boxes are acceptable, and there is a growing demand for white flowers which can be placed in a mixed box or with one other colour.

1959 and 1961 were particularly favourable seasons for protected crops and averaged 3*s.* 0*d.* and 3*s.* 5½*d.* per bunch, all grades, respectively. A five-year average market price, 1957-1961, was 2*s.* 7½*d.* These are gross market returns and do not, therefore, represent the price obtained by the grower. Even so, assessing costs at £1,910 (labour, fertilizers and manure, materials, market and transport charges and other incidentals), the crop is profitable when returning £2,885-£3,000 per acre.

Outdoor cropping

General training and treatment for outdoor cordons is very much the same as for protected crops. Plants can be raised over almost the same period, maintained to full hardiness throughout winter in cold frames, and planted in their flowering quarters as early as local conditions will permit.

It is possible to sow *in situ* in early autumn, covering the plants with cloches during severe weather and only de-cloching when support with canes or brushwood is necessary. *In situ* sowing is ideal in southern districts for hedge crops, as the brushwood serves as a useful shelter when the plants are de-cloched. Hedge crops are cheap to grow and are excellent for small family holdings, where cost of bunching need not be high.

Prices for good, cordon-trained sweet peas are usually attractive, and the specialist can do an excellent job with a large acreage. On the smaller holding, with retail trading, a limited number of plants can also prove profitable. Employing youths and female labour, costs (inclusive) usually fall between 11*s.* and 13*s.* per yard run. Wholesale returns will average 22*s.* per yard. On the other hand, hedge-grown plants will cost less to produce, and returns will vary from 10*s.* to 20*s.* per foot run (retail). Quantities from hedges are surprisingly high—200 feet having produced 2,600 bunches at an average price of 9*d.* Another interesting record is of 4,500 bunches produced from one lb of seed. It should be borne in mind that a bunch from hedge-grown plants contains an undefined number of stems. The operator makes what is considered a reasonable bunch for local demand, which to some extent explains the wide variation of returns. Bunches of this kind are fan-shaped and are of one variety only, with only a small percentage of mixed.

Bacon and Heavy Pigs Compared

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and

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A CO-ORDINATED experiment* (organized on behalf of the Agricultural Research Council) was carried out during 1961 to compare the performance of pigs slaughtered at the recognized bacon weight with that of litter-mates slaughtered at 260 lb live weight. The full results of this experiment will be reported in due course; at this stage only a brief description, together with some preliminary results, is given.

The design of the experiment comprised the comparison of four treatments:

Treatment 1: Bacon pigs (slaughtered at 205 lb live weight) fed according to a scale based on live weight on meal mixture A up to 120 lb followed by mixture B to slaughter. The scale allows for 3·8 lb of meal and 8 pints of water to be fed at a live weight of 75 lb, for example, and a maximum of 6·5 lb of meal and 13 pints of water is reached at 169 lb live weight.

Treatment 2: Bacon pigs (slaughtered at 205 lb live weight) fed *ad lib.* the same meal mixtures as in treatment 1.

Treatment 3: Heavy pigs (slaughtered at 260 lb live weight) fed *ad lib.* on meal mixture A up to 140 lb followed by mixture B to slaughter.

Treatment 4: Heavy pigs (slaughtered at 260 lb live weight) fed *ad lib.* on meal mixture A up to 140 lb followed by mixture C to slaughter.

Treatment 1 represents a commonly-practised method of producing bacon pigs, while treatment 4 follows the method which was recommended for the production of heavy pigs at the time when the test was designed. Treatment 2 was included to allow a direct comparison between bacon and heavy pigs, both fed *ad lib.*, treatment 3 to examine whether the practice of withdrawing protein supplements when the pigs reach 140 lb live weight is sound.

Four pens of eight pigs were used at each centre, the litter origin, initial weight, and sex of these being taken into consideration when allocating pigs to pens. Only pure-bred Large White or Landrace pigs were used. Treatments were allocated to pens at random.

*The test was conducted at the following eight centres: A.R.C. Field Station, Compton; B.O.C.M. Ltd., Stoke Mandeville; N.I.R.D., Shinfield; Spillers Ltd., Middle Aston; Toddington Manor Research Farms Ltd; University of Oxford, Wytham; University of Reading, Upperwood Farm; Warwickshire Farm Institute, Moreton Morrell.

TABLE 1

Main results related to each treatment

	Treatment				Standard error of a treatment mean based on 18 degrees of freedom
	Bacon		Heavy		
	Restricted	*Ad lib.*	With protein supplement to slaughter	No protein supplement after 140 lb	
Live weight at factory (lb)	198·6	199·3	253·3	254·1	—
Daily gain from start to slaughter (lb per day)	1·389	1·544	1·543	1·461	0·030
Efficiency of food conversion from start to slaughter (lb food per lb gain)	3·426	3·593	3·883	4·146	0·049
Dressing percentage (cold carcass weight as percentage of factory live weight)	79·1	80·4	82·5	82·6	0·35
Weight of tissue in the side* (lb)					
Muscle	30·0	30·4	36·9	36·4	—
Fat	24·8	26·1	37·7	38·4	—
Bone	7·4	7·2	8·7	8·8	—
Percentage of tissue in the side*					
Muscle	46·1	45·3	42·4	41·6	0·37
Subcutaneous fat	27·5	29·9	32·9	33·6	0·42
Intermuscular fat	9·7	8·8	9·4	9·1	0·17
Bone	11·1	10·4	9·8	9·9	0·09
Rind	5·3	5·2	5·1	5·1	0·06

*Trimmed side less feet, flare fat and trimmings, kidney and skirting.

TABLE 2

Economic appraisal

	House			
	1	2	3	4
Number of batches per year	2·88	3·19	2·43	2.31
Number of pigs per year	288	319	219	208
Cost of weaner pigs for a year at £5 per head (£)	1442	1594	1093	1038
Cost of food and labour for a year (£)	2681	3009	2888	2885
Value of pigs produced in a year (£)	4868	5198	4426	4208
Profit per year (£)†	745	595	445	285
Profit per pig (£)	2·6	1·9	2·0	1·4
Fixed capital required (£)*	1000	1000	1000	1000
Capital required for weaners (£)	500	500	450	450
Capital required for food, etc. (£)	465	472	595	626
Total capital required (£)	1965	1972	2045	2076
Profit as a percentage of capital†	37·9	30·2	21·8	13·8

*Following Ridgeon[4]

†If the cost of mixture A is £1 per ton greater than the value given in the text above, the profit per year (£) becomes 705, 553, 410, 251, and the profit as percentage of capital 35·8, 27·9, 20·0 and 12·1 respectively for the four houses.

Rations

The meal mixtures, compounded at and distributed from a central depot, were made up as follows (percentage parts by weight):

	Mixture A	*Mixture B*	*Mixture C*
Barley meal	52½	52½	57½
Ground wheat	24	24	24
Weatings	16	16	16
Fish meal (63·5% crude protein)	7	—	—
Soya bean meal (45% crude protein)	—	5	—
Limestone	½	1	1
Di-calcium phosphate	—	1	1
Salt	—	½	½
Cost/ton	£30 17*s.* 7*d.*	£29 17*s.* 7*d.*	£29 5*s.* 0*d.*

(Supplements were added to all rations to supply 4 million I.U. of vitamin A and 1 million I.U. of vitamin D per ton, 10 g per ton of a broad spectrum antibiotic and 100 p.p.m. of zinc)

Carcass quality

All pigs were slaughtered in the factory of Messrs. C. and T. Harris, Ltd., Calne. A standard pre-slaughter procedure was adopted by which pigs were weighed on the morning of collection and received no food subsequently. The pigs were weighed at the factory at 8.30 a.m. on the following day, and slaughtered at 9.30 a.m. Normal factory routine was then followed, except that carcasses were split down the middle rather than chined; the weights of liver and flare fat were recorded and measurements of length, and back-fat thickness in five positions were taken on the hot carcasses. After cooling for twenty-four hours the heads were cut off, the feet and fillets removed from the left sides, these then being divided into shoulder, gammon, back and streak in a standard manner. Each part was carefully separated into bone, subcutaneous and intermuscular fat, rind and muscle.

Appraisal

All previous Agricultural Research Council co-ordinated experiments involving growing pigs have been evaluated using an economic model described in detail by Braude, Townsend, Harrington and Rowell[1 2 3]. This assumes an enterprise with four fattening houses of the same size, in which the method of production corresponds to that of the four experimental treatments. The same procedure has been followed in the analysis of this experiment, with the slight modifications made necessary by the nature of the treatments; the prices for food and carcasses used in this analysis correspond to those in operation during the period of the experiment. Profit per pig and profit per house per year have been calculated for enterprises using the four treatments as their standard methods of production. Following Ridgeon[4], this profit per house per year has been expressed as profit per unit of capital.

The mean values for each treatment of several important characteristics are presented in Table 1, and the results of the economic evaluation in Table 2. More detailed data, together with discussion of the results and proper acknowledgments, will be presented in a full report which will be submitted for publication in the *Journal of Agricultural Science* in due course.

Some of the pigs at one of the centres grew at an abnormal rate during the early part of the experimental period for reasons unknown. The results from this centre have not been included in this preliminary report, but it can be said that their exclusion did not materially affect the overall results.

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Cereal Problems on the Wiltshire Chalk

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In the past twenty years the Wiltshire Downs have been transformed from sheep country into a good cereal-growing area. But not without some problems, as this article shows.

To give readers a present-day picture of cereal production on the chalk formations of Wiltshire, it is necessary to look back into history, when these lands were unfenced and unwatered and when one could ride for miles without interruption or hindrance, perhaps without seeing any form of life apart from birds and rabbits, of which there were thousands. Much of this land, which was ploughed during the 1914-18 war, was allowed to "fall down" in the depression years which followed. The famous Hampshire Down sheep, which used to roam these areas by day, returning to folds on roots or vetches by night, were gradually dispersed, until today only a few remain.

During the 1930s things became even worse, and many farmers went out of business. It was during this period that one of Wiltshire's pioneers introduced a new system of milk production to these downs—one destined to be known all over the country as the Hosier bail system. The capital required was small—a boundary fence, a Hosier bail and some Irish heifers. Milk was produced cheaply, more and more cattle replaced the sheep, and those farmers who adopted this system survived. Then came the war, and the vital need to step up the production of home-grown food.

Where better to grow cereals than on Wiltshire's rolling downs and plains? Some land had never been ploughed; some not for many years. Cattle and sheep had grazed over the downs for years; the land should have been in good heart. But was it? Many acres were ploughed, corn was sown and, in due time, germinated. All looked well for a few weeks and then plants began to fail, some turning a purplish hue, some yellow; yields were very poor, and many crops failed.

From poverty to riches

Where was the expected fertility? The soil was analysed, and acute deficiencies of phosphate and potash were diagnosed—potash being especially low. Supplies of these mineral fertilizers were not plentiful, so allocations were made on a permit system and crops began to improve.

This, I suppose, was the first important discovery which began the chain of events which virtually revolutionized chalkland farming. Then came the combine drill, and yields increased. The combine harvester followed. The drying, storage and bulk collection of grain developed, and our plant breeders introduced—and indeed are still introducing—varieties which, when dressed with suitable fertilizers, gave higher yields. As a result of all this, the land has become capable of producing magnificent crops, and in a comparatively few years its value has increased enormously. Land which, in the 1930s sold for less than £10 an acre, has today rocketed to £150 plus; fields have been fenced and watered, allowing alternate husbandry to be practised, and the real potential of these farms is anyone's guess.

Farming on these soils is relatively easy and, because of its profitability and the way in which it can be mechanized, cereal production is very much to the fore. In fact, the growing of corn has become so profitable that farmers are now wondering just how many cereal crops can be produced without risking a loss of yield through disease or some other factor.

Prevalent diseases

Some fields are now growing the sixth, seventh and eighth continuous crop of barley, without any sign of reduced yields. On the other hand, many farmers are being increasingly troubled with take-all, cereal root eelworm, and, on certain soils, a condition which we now refer to as "blindness", no grain being formed in the ears.

Take-all has been with us for many years and has been kept within bounds by varying the type of cereal sown, e.g., an occasional oat crop or a root-break, and the judicious use of nitrogen. Some farmers are using a modification of the Chamberlain system with success, and on one farm where N.A.A.S. specialists are co-operating in an experiment, yields have been maintained by undersowing 8 lb of Westernwolth ryegrass in the corn crop. The seed of the Westernwolth ryegrass, which ripens and sheds before the barley is ripe, germinates in the stubble. This autumn growth uses up soil nitrogen and seems to starve the fungus—preventing it from building up to a level where it would affect yields. This particular experiment is in its fourth year. Yields are not high (about 24-25 cwt an acre) and the field is now carrying its eighth corn crop. The ryegrass, which by harvest time is dead, causes no trouble to the combine.

Cereal root eelworm is becoming more and more troublesome. The build-up of cysts in the soil is very rapid, and although heavy applications of nitrogen will help the crop to grow out of the trouble, it is doubtful whether it is economic at the higher levels. Our main hope must be that the plant breeders will come to the rescue with good-yielding eelworm-resistant varieties; otherwise a period under leys is the only alternative on the chalk.

Blindness in the chalk country exists mainly on the black, puffy soil, which has a high organic content. The condition is aggravated when corn follows a crop of kale or roots which has been given generous nitrogen treatment.

In the case of wheat, the crop appears to grow normally, and, indeed, in late June or early July, many farmers have complimented themselves on its excellent appearance. But as harvest approaches, instead of ripening normally the crop remains green, and on examination, the ears are found to be empty. Associated with this condition is a black discoloration on the stem below the ear and also lower down. With barley, the crop virtually disappears; the condition is not unlike a severe attack of take-all. Yields of both cereals are severely reduced and in many cases the crops are not worth harvesting.

At first, this peculiar condition rather baffled the N.A.A.S. regional specialists; no disease could be identified. Soils were analysed and phosphates and potash added where necessary, but this made little difference. Atle wheat seemed especially susceptible, and it was thought that a wet summer encouraged the trouble. The plants were found to contain excess nitrogen, present as nitrate nitrogen, which for some reason was not being converted to protein. This gave the first clue to our soil chemists, who diagnosed a trace element deficiency—but which?

Two years ago a series of plots was laid down and the main trace elements were applied as a foliar spray. The result was outstanding—only two appeared useful—copper, and to a small degree molybdenum. These trials were repeated in 1961, and the plots treated with copper have again been outstanding, so much so that we can confidently recommend a copper spray in the spring on either wheat or barley which is being grown on this particular type of soil.

Much remains to be investigated, but our soil chemists have made an important break through and they—particularly Mr. L. J. Hooper—deserve our congratulations. I understand that the full results of their work to date will be published shortly.

To spend or not to spend?

It may now be asked how much capital should be spent on cereals? I do not pretend to know the answer; it can be virtually nil to £25-30 an acre, or perhaps higher, dependent on a number of factors.

Ideally it could be said that farmers should provide themselves with drying and storage facilities to cope with the whole of their harvest in a normal season. So provided, they could keep their grain off the market in August and September and sell when prices are more favourable. Many farmers are, of course, well equipped; others who installed plants some years ago, are finding both drying and storage inadequate. Should they modernize? If capital is available and a reasonable return can be expected on money so invested, the answer is yes. But the capital investment is heavy, and a lot of thought is needed before spending money too freely on projects which might be in use for only a few months of the year and can be put to no useful purpose for the remainder.

I have three farmer friends who have dealt with this problem in different ways.

Farmer "A" has 200 acres of continuous corn. He has no labour and no machinery—all his work is done by contract. In five years not more than half his corn has ever needed drying, and his profit has varied between £8 and £11 an acre; for last season it could be over £12.

Farmer "B" has 600 acres of corn, but no drying plant or storage bins. His buildings are good, and concrete floors have been laid in most so that corn can be spread and stored in bulk or in sacks. Three combines deal with this acreage, and last year most of the barley was sold for malting. This farmer has no intention of spending any capital on a drier or storage bins; he believes that his buildings should be dual-purpose, and he is more successful than most.

Farmer "C" has 1,000 acres of corn. He has spent over £20,000 on a drier and storage bins, apart from a combine, etc. Corn is handled quickly and efficiently, and the weather causes few headaches. Again, this farmer is very successful, with above-average corn yields.

Three farmers—nil to £20,000 plus—all successful—which is right? I leave it to you to judge.

Speaking more generally, the average capital investment on dead stock and equipment for a mainly cereal-producing farm in the county is £20-25 an acre. A recent survey by Bristol University into costs and returns on a number of Cotswold and Wiltshire Down farms, produced a variation in capital investment between £16·2 and £34·4 an acre, with a management and investment income varying between minus £2·4 and plus £19·3 per acre, with an average return for the group of £8·6. The group included some milk producers; if these are excluded, the capital investment for dead stock and equipment varied between £19·3 and £34·4, and the management and investment income between £2·9 and £13·5 an acre. From these figures it will be noted that cereal production can be very profitable, but costs are rising and margins are tending to fall.

Great changes in arable farming have taken place in the last twenty years, and equally far-reaching developments can be expected in the immediate years ahead—changes and a challenge which I am sure our farming friends will meet with success.

Bridget's Pedigree Ayrshire Herd

P. J. JONES, B.Sc. (AGRIC.)

Director, Bridget's Experimental Husbandry Farm

Well-managed grass, with lucerne as a summer insurance, is the key to the productive management of the dairy herd on the Ministry's Experimental Husbandry Farm, Bridget's, near Winchester.

THE Bridget's herd of pedigree Ayrshires is founded on the Lillington herd established by Miss Underwood, of Dorset, and Bridget's was indeed fortunate to have this herd to build on. A few of the original animals are still on the farm.

Since it arrived at Bridget's, the herd has been developed by the use of carefully selected bulls, mainly from the Ickham herd, but more recently Eyton blood has been introduced. Artificial insemination carried out by the Hampshire Cattle Breeders' Society is also used on selected cows. Nearly all the heifer calves are reared and the herd now numbers approximately 280, with between 100 and 130 cows in milk at any one time. Half of these are calved in the autumn and the remainder in the spring. The 1959-60 recorded yields were:

80 cows	9,976 lb	3·89 per cent B.F.	383 C.I.
24 heifers	8,040 lb	3·93 per cent B.F.	

The dairy unit is centred at the main farm and consists of five covered yards where 85 animals can be yoked separately. The cows are milked twice a day by two men in a 6-unit 8-stall-abreast type parlour. The main advantage of this arrangement is that the feeding of both roughages and concentrates takes place in the yards, nothing being fed in the parlour. Experimentally, of course, this is essential, because more careful and accurate feeding is possible and experimental rations can be weighed out by the technical staff well in advance and left ready for feeding at the appropriate time by the stockmen. The cows have ample time to eat their concentrates and, where the capital outlay can be justified, this system is to be preferred. All animals readily enter the parlour for milking, and the job of feeding concentrates is removed from the milking routine.

All yields are recorded at each milking and the cows are carefully rationed according to yields, the quantity of concentrates fed to each cow being adjusted every week. Steaming up is practised and an allowance of 6 lb of concentrates a day is made for a period of six weeks prior to calving; after calving cows are fed for four weeks and heifers six weeks at a gallon more than yield. Hypomagnesaemia is an acute problem, but it is successfully controlled by feeding calcined magnesite at the rate of 2 oz a day to all milking animals while at grass. This is incorporated in coarse-ground barley meal fed at the rate of 2 lb a day, and forms part of the concentrate ration.

Summer milk

The herd is managed to produce as much milk as possible from grass, including lucerne, hay and silage. As a result of supplementary feeding trials carried out during the last few summers, it has been possible to demonstrate the value of well-managed grass for milk production, and these results are applied to the herd. The first work undertaken was to feed a supplement to high-yielding cows during the months of May and June while on good-quality spring grass and compare the results with those of similar cows receiving no supplement. The cows were all spring calvers giving an average of 5 gallons a day. The supplements fed were either coarsely-ground barley meal alone or a balanced dairy concentrate containing 17 per cent protein. Only in one year in four was it economic to feed any supplement, and that was in 1957 when very cold dry weather markedly reduced the spring growth of grass. This extra feeding was continued only up to the end of June but yields were recorded throughout the rest of the summer. It was found, however, that feeding in the early part had no effect on the later stages of the lactation. Butterfat was not affected by this feeding, but S.N.F. did show a small but not significant increase in two years.

As a follow up to this earlier work, for the last two years an experiment has been carried out on feeding spring-calved cows during late summer and early autumn—July to September. In these trials the cows were on good grass or lucerne and three selected groups were fed for production over 1½, 3 or 4½ gallons a day respectively. Again, in neither year did it prove to be economic to feed concentrates to this class of stock, although both B.F. and S.N.F. rose as concentrate feeding increased. As a result of this work, the summer feeding of the cows is based on grass and lucerne. The cows are first turned out by day only on to a catch crop of Italian ryegrass managed for early bite. Concentrates are progressively reduced until only the tying-up ration of 2 lb a day barley meal containing the calcined magnesite is fed. Hay at 2 lb a day is continued for at least the early part of the summer. This method of feeding lasts until October, when the cows go on to strip-fed kale for a period of 6-8 weeks.

Winter feeding

Winter feeding is based on kale until December and then grass silage. Self-feeding is practised. It is always the aim to make a silage with a high dry matter (28-30 per cent) and all material is wilted before ensiling. It has been found that the cows will eat only about 56 lb of this material when self-fed but about 10 lb more when it is cut and carted to them. This lower quantity of silage reduces the intake of dry matter but it does not have any effect on milk yield or quality, although cows on self-feed silage always lose weight. Provided the cows are in good condition at the beginning of winter, this loss in weight is not serious and is soon made up again in the spring.

In addition to the silage, 5 lb a day of hay is fed; together this gives maintenance plus at least 1½ gallons. Until this year a balanced home-mixed dairy concentrate containing 70 per cent cereals has been fed at 3¾ lb per gallon over 2 gallons, but in order to balance the excess protein from the silage and to make greater use of cheap barley, the second two gallons will come from rolled barley alone. Not until the cow gives more than 4 gallons will any purchased protein be fed.

In 1960 the Bridget's herd produced 122,000 gallons of milk, and it was necessary to feed only 1·73 lb of concentrates per gallon of milk produced. When, however, 2¼ cwt of the same mixture fed for steaming up was included, the concentrates figure increased to slightly more than 2 lb a gallon. To get this performance, grass has to be well managed. P and K are applied each year, and up to 160 units of nitrogen may be given in three or four dressings. Grazing is controlled by an electric fence and the pastures are trimmed after each time over.

One difficulty in relying on grass for summer keep is that in a dry year such as 1961 recovery of the grass after grazing is slow, and to ensure sufficient summer keep 30 acres of lucerne are grown. This is left down for 3-4 years and is cut for hay and subsequently grazed, giving three or four crops each year.

Herd replacements

All heifer calves, provided they are out of good cows, are reared and selected animals eventually come into the herd, calving at between 2¼ and 2½ years. These herd replacements are reared as cheaply as possible. If autumn-born they are weaned at five weeks and fed to gain between ¾ and 1 lb live weight a day, getting best quality hay and little concentrates. They are turned out to grass as early in the spring as possible; from about the end of March they rely entirely on grass. Great store is set upon early turning out as a means of reducing expensive concentrates, since experience has shown a steady liveweight gain from grass. As yearlings they are housed and fed 2 lb of concentrates a day and silage to appetite. They run with the bull during the following spring, getting only grass or silage and straw during the winter until steaming up begins.

With spring-born calves, even greater use is made of grass. Calves born from the third week in February onwards are turned on to grass within forty-eight hours of birth. A cheap type of shelter is provided, in which is fed about 14 gallons of whole milk and then milk substitute until they are weaned at 8 weeks of age. From then onwards they feed entirely on grass until October, when some form of supplementary feeding becomes necessary. This is an extremely cheap way of rearing heifer replacements and seems well suited to our conditions in the south.

Our aim is therefore to keep high-yielding cows milking mainly on grass and home-produced cereals. Purchased protein is given only to the highest-yielding cows during the six winter months.

Time is Money

A. S. CHRISTENSEN and G. P. PRINT

This old adage is being proved true at Buckhurst Farm, Withyham, Sussex, where the handling of fertilizers, grain and feedingstuffs is being speeded up by mechanical methods and bulk storage. Buckhurst Farm belongs to EARL DE LA WARR, and Mr. Christensen is the Farm Manager.

DURING recent years, conferences have been held and much has been said and written about work study, but it is still very doubtful if the importance of saving time is fully realized. After all, time is one of the most precious commodities, be it in work or pleasure. Once lost, it cannot be regained. Also, time is money, and if only a minute a day is lost during 300 working days it means a total loss of five hours. How many of us can truly claim not to waste at least fifteen minutes a day, or nearly two working weeks a year? All this, however, is mere chicken feed compared with the time and energy most of us waste on our farms due to bad planning, bad layout, or simply doing jobs which are quite unnecessary.

Buckhurst Farm consists of 775 acres, 120 acres of which are wheat and 200 acres barley. The rest is grass—approximately one-third S. 22 ley, one-third semi-permanent pasture, and one-third long leys. Present stock comprises 125 dairy cows and their followers; a small Sussex beef herd—30 breeding cows; 700 heavy hogs and a flock of 500 Clun breeding ewes. The farm is managed strictly on commercial lines, much emphasis being placed on grassland management and grass utilization, very little concentrates being fed to the dairy herd. The cows are housed in yards, milked through a six-standing six-unit abreast parlour; during the winter the self-feeding of silage is practised. The land is by nature very poor,being very deficient in lime and phosphate.

In the past we were as guilty as anyone of doing unnecessary jobs. For years we spent well over £200 a year tying and untying cows and cleaning mangers. We have since realized that cows are much better off not being tied at all and eating their food straight from a silage clamp. During this time also we had picked up, thrown down and moved about some 400 tons of silage so many times that before it got to the cows we had man-handled over 2,000 tons a year, and all this for nothing.

Easier and quicker handling of fertilizers

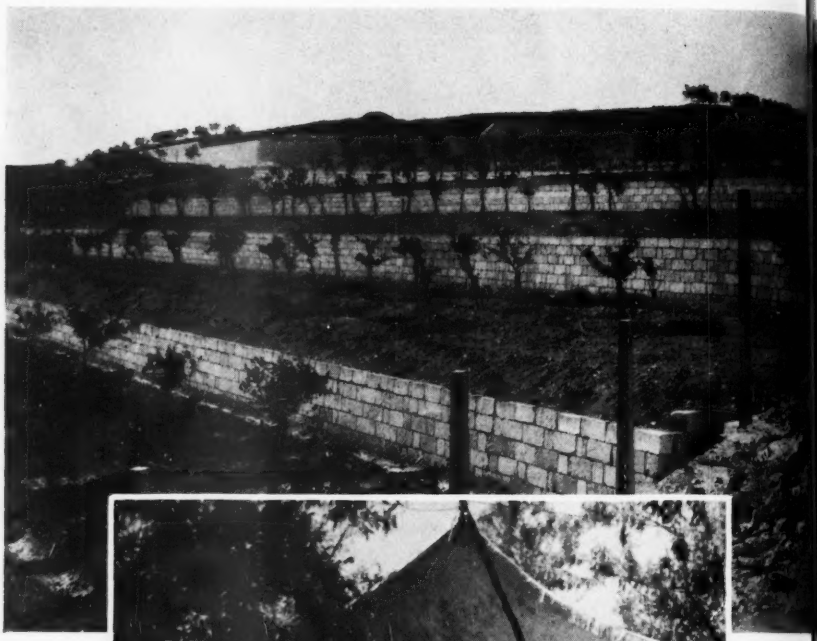
Our handling of artificial fertilizers presented very much the same picture. By the time it had been unloaded at the station, carted home, stacked in the store, re-loaded, carted out to the fields and got into the drill, somebody had lifted over 2,000 tons in 1 cwt, or some years ago 2 cwt, bags. Modern granulated fertilizers lend themselves better to bulk handling than most other materials, but storage and, to some extent, the use of the combine drill, have deterred a lot of people from pursuing the possibilities of mechanical handling.

In our case the combine drill presented no problem because we gave up combine drilling twelve years ago. Since then we have broadcast all corn or

Photos: *South Eastern Electricity Board*

Grain being conveyed into bulk store by means of a flexible auger.

Holding tank for super mixes, together with bulk loading tank.



Photos: *W. E. Shewell-Cooper*

Above. Many hillsides are terraced like this for growing peaches.
Below. Women not only pick the nuts but clean them as well.

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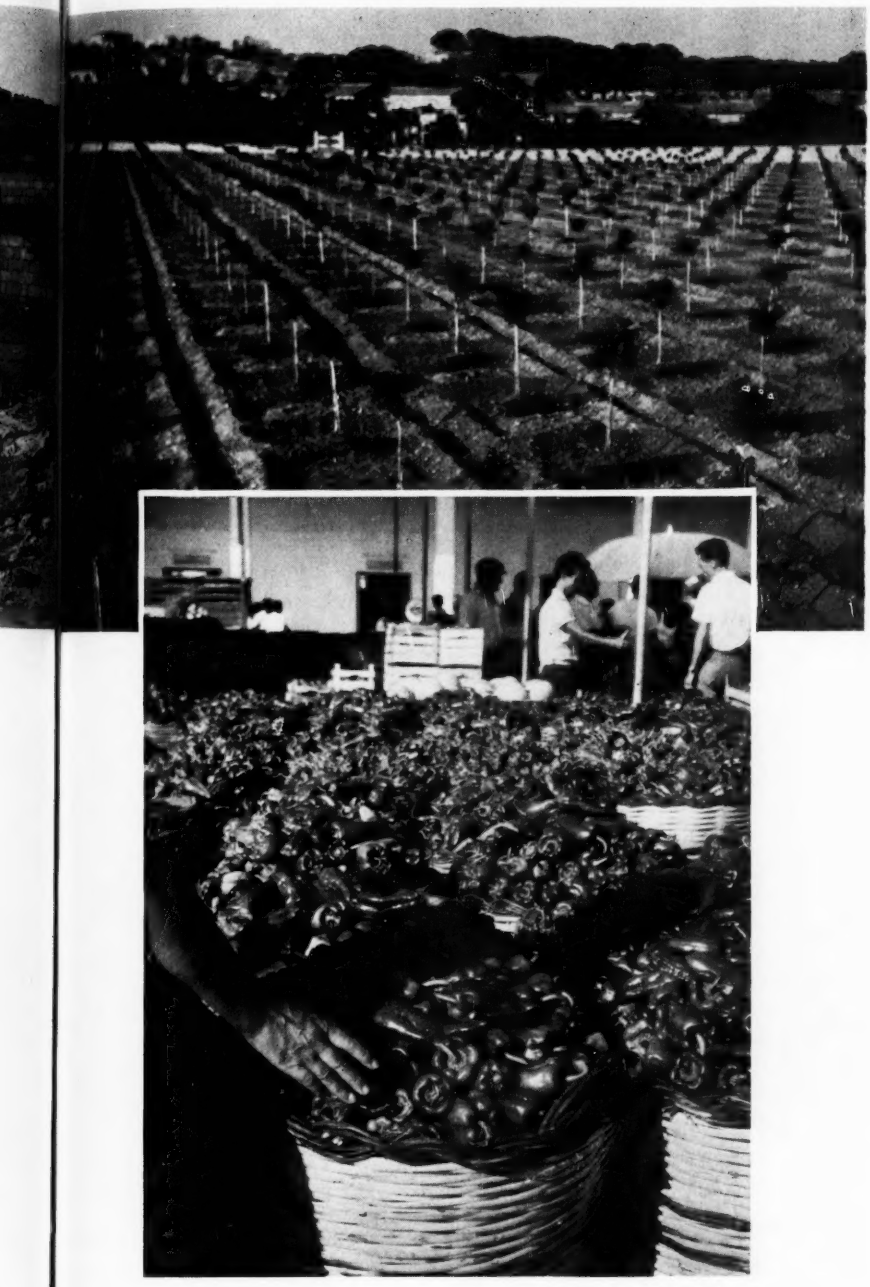


Photos: *W. E. Shewell-Cooper*

Above. A young orange orchard. Note the depressions for watering.
Below. Peppers galore in the Syracuse market.

Photo: *F. H. Wa*

Setting out 5-cwt stillages before starting picking.

A 10-cwt stillage on the tractor fore-end loader being tipped into the bulk hopper of the potato riddle.

grass seeds and fertilizers with an ordinary fertilizer drill of the plate-and-flicker type, either by sowing them separately or by mixing them beforehand.

It has always been the belief that there is something mystic about the storage of fertilizers, when in actual fact they store extremely well in bulk, provided they are on a dry floor, under a sound roof and covered by a polythene sheet to keep out atmospheric moisture. We believe this to be the cheapest and most satisfactory way of storage, be it compound or nitrogenous fertilizer. Bins, whether portable or permanent, are expensive; it is often difficult to fill them or to extract their contents; their installation means more money locked up in fixed equipment and, with the repeated changing pattern of farming, the more flexible the methods used, the easier it is to change from one system to another.

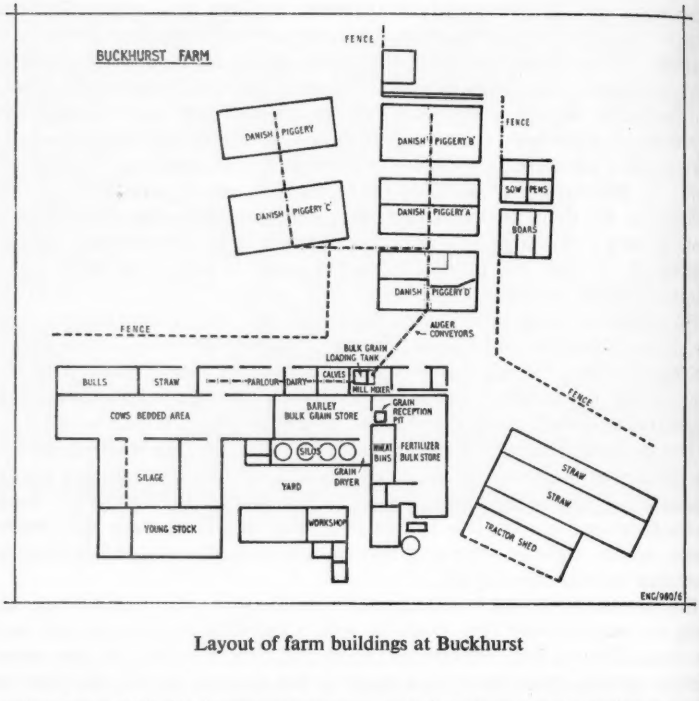
On this farm we decided to go bulk a year ago, and the fertilizers are now bought in 15-ton lots and simply tipped in a heap on the floor in a single-span concrete building. Using this method of unloading it is important to have adequate tipping height—approximately twenty feet—in order to get enough angle to enable the materials to be discharged. The heap is then covered by a moisture-proof sheet and left. Augers have been advocated for unloading, but the cost of maintenance due to corrosion must be very high, and also the rate of unloading comparatively slow. When re-loading, we use the bucket on the front-end loader. It is simple to operate and needs very little maintenance; so far, signs of wear and tear have been negligible, and loading has presented no problems at all.

Unfortunately we had to change our method of spreading, and we are now using a trailer-spinner type machine with a carrying capacity of just under two tons. Here we have experienced some difficulty in getting an even spread. Certain modifications have been made to the machine during the year, but there is still room for further improvement. This short-coming, I understand, also applies to other makes of similar machines and manufacturers must do everything in their power to get this put right as soon as possible. We bring the machines to the store for each load because, with a comparatively short distance to travel and the amount carried, we have not found it worth while to bring the fertilizer to the field in bulk.

Bulk handling of fertilizers saves the lifting of tons and tons of heavy material, but, from a farming point of view, the real advantage is speed. One man, hardly leaving the tractor seat, can spread 15 tons a day, covering up to 100 acres. To be able to do the job at the right time is of great importance at seeding time, and on a farm like ours, where grass plays such an important part, it is also absolutely vital that nitrogenous fertilizers should be applied at the right time, especially before and during silage-making. Bulk handling has enabled us to do just that. It is difficult to assess exactly its value in terms of £.s.d., but there is no doubt that it has been well worth while. In terms of hard cash, a premium is given for taking the material in bulk, and as all weights are net, there is a further saving on this account. These two factors alone amount to over 30*s.* per ton.

Bulk handling and storage of grain

During the past few years it became apparent that the handling and storage of grain and the preparation of animal food on the farm were not



Layout of farm buildings at Buckhurst

keeping pace with the increased output, and that they were relatively expensive in labour. Much thought was given to the problems, and discussions took place with many people with knowledge in this field about modernizing the plant to bring it into line with the increasing productivity of the farm. From these discussions a decision was made completely to re-organize the grain handling and storage and the feeding of livestock. The new plan was to be based on storing the grain in bulk, with mechanized handling and with the preparation of feedingstuffs and their delivery to the consuming point to be, as far as practical, automatic with the minimum requirement of manual labour.

The new plan for grain handling and storage was put into effect, and finished in time for the 1961 harvest. Re-organization of the food preparation plant started following the completion of the harvest, and the first phase of this scheme is now complete.

The old grain drying plant was one of the earliest of the ventilated bin type, having been installed in 1949, consisting of five stave-type concrete silos, each of 40 tons capacity, and four smaller square bins, which brought the total capacity to about 300 tons. All nine bins had perforated false floors for ventilation by an electrically-driven fan, with an electric heater of 21 kW. Grain was handled into and out of the bins by a pneumatic conveyor. The plant gave excellent service and worked very satisfactorily until the last few years, when the amount of grain being grown far exceeded the designed capacity. The wet harvest of 1960 caused considerable anxiety when something

like 100 tons of wet grain had to be held on the floor for some weeks before it was possible to dry it in the bins. It was therefore necessary to increase the grain storage area and to have facilities for the quicker drying of grain to take care of the wet harvests.

In order to simplify the running of the farm, especially the storage of grain, only Rika barley and Cappelle wheat are now grown. A building adjacent to the silos, originally a large cowshed and recently used to house bulls and calves in pens, was converted to a bulk grain store. The floor area of 70 feet by 33 feet will accommodate 350-400 tons of grain, which will generally be barley, for stock-feeding. The conversion of the building only required the removal of the pen partitions, levelling of the floor, and replacement of the perspex roof light panels by asbestos sheeting to make the grain store dark to deter birds (there were no other window lights in the building). One stave-type silo was removed so that a drier of the high temperature, continuous flow type could be installed.

Having a bulk store means that there is a considerable saving in expenditure which would otherwise be necessary for storage bins. Furthermore, the building is left free of obstructions when not holding grain and, should there be a change in policy, it can easily be switched to another purpose. Future plans include the removal of the small grain bins to make room for a bulk store for wheat.

A grain reception pit under cover close to the bulk store has an approximate capacity of three tons. Tipping trailers are used to bring grain from the field, and these drive on to the pit to deposit their load. From the grain pit a 30-feet flexible auger, which is one of six used on the farm, takes the grain to a transfer point situated in a corner of the main grain storage shed. From here it is taken by a rigid 21-feet auger to a grain cleaner; then from the cleaner by another auger to the grain drier, which has a drying rate of 3 tons per hour when extracting 4 per cent moisture. After drying, the grain is augered away to the storing point, using, when necessary, a series of the flexible augers. These are mounted on a travelling rail to permit easy movement from one position to another.

To provide for sales of grain off the farm, a bulk grain loading tank of 20 tons capacity has been installed. This tank can be filled from either of the holding positions with a series of augers. It will, however, be in continuous use, when not required for outloading as a grain hopper, to feed the mixing and milling unit.

Automatic mixing and grinding

For very many years it has been farm policy to use home-grown grain for livestock feeding. In 1945 a small automatic electric hammer mill was installed for grinding, but mixing with bought-in minerals and proteins was always done by hand. Now a new mix-mill, one of the first of its type in the country, will do all the mixing and grinding required for the stock. The mix-mill unit is fitted under a nest of four hoppers, each with a capacity of 3½ tons, and is adjacent to the bulk grain loading tank.

A pre-mix, containing minerals and protein to the particular feed requirement, is bought in bulk. Three different pre-mixes are necessary, one for a pig rearer meal, another for heavy hogs and the third for dairy foods, including food for calves and sheep. These pre-mixes are held in three of the

hoppers, whilst the fourth hopper is used to hold wheat. Barley required for the rations is held in the bulk grain loading tank.

The mix-mill unit comprises a proportionating device and a hammer mill. The required ingredients for a ration are measured into the mill by the proportionator and, once set for a particular ration, the unit will continue producing the complete mix until stopped or until the supply of grain, etc., is used up.

From the mill the mix is conveyed automatically to the consuming point. The dairy foods are passed through a cubing machine to be delivered by elevators and conveyors direct to the feed hoppers in the milking parlour, to a hopper in the calf house, or to a hopper for the sheep. A tractor-mounted spreader, gravity filled from the hopper, will be used to take the food out to the sheep in the fields. Operation of the mix-mill unit, the cubing plant and the conveying system for the dairy foods is on a time basis; the proportionator is set and the plant switched on to run for a pre-set time. Pig foods will be taken direct from the mill unit by an auger system to self feeders in the piggeries. In this case the unit will run until the last hopper in the line is full, when the plant is automatically closed down. All the stockmen have to do is to set the controls on the proportionator, open the appropriate valves and switch on the plant.

For a start, only one piggery will be converted, but plans are proceeding to equip four more houses of similar size. Bedding down with straw will be done twice a week, and cleaning out will take place after each batch of pigs, using a front-end loader. It is hoped to reduce labour requirements per pig by 65 per cent.

Focus on Vining Peas

A. J. GANE, C.D.A.

Director of Research, Pea Growing Research Organisation, Yaxley, Peterborough

This article highlights some of the problems of pea growing today, and describes some of the work being carried out to overcome them.

VINING peas, both for canning and quick freezing, have for years spelt big business for growers and processors, particularly in the Eastern Counties where, in many areas, they play a vital part in the farming system. Team work is probably of more importance than with any other crop, and a high degree of co-operation between farm and factory is essential if success is to be assured. Peas are not the easiest of crops to grow—there are many pitfalls—but a lot of the risks have been reduced, if not eliminated, by the researches of the last ten or fifteen years.

Peas are the most important crop grown for canning and for the fast-expanding quick-freezing industry, and every aspect of growing, harvesting and processing comes under close scrutiny in the effort to produce more peas per acre, of the best possible quality and over as long a period as possible.

The use of a carefully selected range of varieties can do much to help in this respect. Quick-maturing varieties sown on early land as soon as practicable in the spring, and slow-maturing varieties sown on late land at the end of the drilling season, can obviously extend the season.

With this object in view, there is a constant search for improved varieties. The Pea Growing Research Organisation carries out variety-screening and quality-assessment trials each year, in conjunction with the Fruit and Vegetable Canning and Quick Freezing Research Station at Chipping Campden. Scores of varieties from all parts of the world are carefully studied and compared with those now in commercial use. Full details of the many observations made in field and laboratory are published annually[1], and form a useful guide for the selection by the industry of varieties best suited to individual needs and conditions.

Yield and quality are clearly of the utmost importance, while such aspects as resistance to disease and susceptibility to herbicides[4] also receive attention.

Weed control

The problem of weed control in peas is one in which great strides have been made, and yet it still forms a major line of enquiry. Not only can weeds reduce crop yield, but they can also add greatly to the cost of harvesting and vining, they may be responsible for off-flavours, and the presence of weed flower heads and other fragments may necessitate added expense in cleaning operations at the factory.

The armoury of herbicides available for use in peas is growing fast, not only in numbers but in complexity. At present the most widely-used are the ammonium and amine salts of dinoseb, which undoubtedly brought about the greatest revolution in pea growing practices which any herbicide has yet achieved. Before their introduction, a far greater proportion of pea crops were sown in wide rows than is the case today, to facilitate weed control by inter-row cultivations. The dinoseb salts were largely responsible for changing this state of affairs; narrow-row drilling became increasingly popular, and still more peas are grown in this way each year.

Although the dinosebs are excellent for the control of mixed populations of annual weeds, the search for even better materials continues. Equally efficient, but cheaper, herbicides would obviously be attractive, but the increasing awareness of the inadvisability of using such highly toxic materials in agriculture is probably an even greater spur.

MCPB also has its place in peas, particularly for the control of thistle and dock, but the range of weeds against which it is effective is comparatively small.

The control of wild oats in peas with TCA, was, when first introduced, a great step forward, although there are now new materials for use in other crops which result in far less reduction in yield. Barban and di-allate have been used experimentally in peas and have shown promise, although further work is necessary before firm recommendations can be made. Propham, too, is a useful herbicide for the joint reduction of both wild oats and a number of broad-leaved weeds, and it has the advantage that less incorporation into the seedbed is required than with TCA.

Much attention has been paid in recent years to "residual" herbicides[5], and there will undoubtedly be interesting developments in this field in the near

future. The P.G.R.O. and other workers have noted, in particular, the influence of soil type on the efficiency of these chemicals. For example, a material applied on a peat soil will probably be absorbed so completely and so quickly that virtually no weed control whatsoever is obtained, whereas the same material applied on a sand may bring about a complete kill of weeds—and the crop as well.

Progress will be made, firm recommendations will be forthcoming, but they are unlikely to be of such a general nature as we have been used to in the past; they will probably be specific treatments for use under specific conditions of weed, crop, weather and soil. In many cases it will be up to the grower to try out such materials for himself, on a very limited scale, to ascertain the effects to be obtained on his own particular land.

With this increase in the complexity of weed control, it is more important than ever to be quite sure that the instructions of the manufacturer are carefully read and carried out to the letter.

Chemical weed control is so topical a subject these days that other methods are inclined to be overshadowed. Although the sprayer is now so widely used, it is no substitute for good husbandry. Stubble cultivations and early ploughing still provide not only the "stale furrow" and friable, well-aerated tilth which peas so much appreciate, but also a means of killing off many weeds before the crop is sown, and at very little cost.

Pests and diseases

It has often been said that peas have more than their fair share of pests and diseases, but again, in the light of research, the risks are not what they were. The introduction of DDT, and later such other insecticides as Malathion, "Rogor" and "Phosdrin", has enabled the grower to control many pests. If undue losses are to be avoided frequent inspection is the first necessity, coupled with the ability to recognize the presence of pest attacks; early attacks of pea weevil, especially under poor growing conditions, can cause heavy damage if allowed to go unchecked. On cloddy seedbeds, the prolonged absence of emerging seedlings must always be investigated, as this may well be due to weevil attack rather than merely poor conditions of tilth. With this pest, early in the season, and with aphis, during flowering, heavy infestation may appear very quickly, and frequent inspection, followed by prompt action where necessary, are most important.

There is no doubt that the wood pigeon is a major pest of peas, and its depredations are only too well known. The use of automatic scarers is a costly and rather laborious business, which is at best only partially effective, but the systematic destruction of nests has been shown to be well worth while.

Fresh cases of infestation by pea root eelworm[6] still occur each year, and most processors now incorporate a clause in their contracts stipulating that peas must not be grown on the same field more than once in five years. Recognition of this pest, too, is important, particularly since, if it should escape detection, the results from subsequent crops of peas in that field are likely to be increasingly disappointing.

The appearance of patches of poor growth in a pea crop, where the plants are rather yellow and sickly in appearance and show reduced leaf development compared with plants in healthy areas, should immediately be treated

with suspicion. Careful raising of such plants and gentle washing of the roots will reveal the presence of minute white, yellow or brown lemon-shaped cysts. Where these symptoms occur, growers are asked to report the matter either to the P.G.R.O. or to the N.A.A.S., from whom further advice may be obtained. This pest is the subject of a long term microplot-trial[7], now in its second year, being carried out jointly by the P.G.R.O. and Rothamsted Experimental Station.

There are many diseases which attack peas, but comparatively few are of general economic importance in this country. A notable exception is downy mildew, which causes particularly heavy losses in wet seasons, and which is typified by the pinkish-grey felt-like growth on the undersides of the leaves. Many fungicides have been tried, both here and overseas, but economic and lasting control has not yet been achieved. Investigations have, however, disclosed marked differences in varietal susceptibility to the disease[2], and in areas where it is particularly troublesome this factor should be borne in mind when selecting varieties for sowing. It has also been suggested that the severity of attack is increased by any form of physical damage to the leaf tissue, such as is caused by harrowing or rolling. This disease is so important that investigations are being intensified; the P.G.R.O. and the N.V.R.S., Wellesbourne, are jointly planning a programme of study on the subject, which will start in the spring of 1962.

In some areas, notably Essex, pea wilt is a disease of importance. The symptoms in this case begin to appear in early June; there is a greying of the foliage, marginal up-curl of the leaves, and, eventually, complete withering and death. On close examination a swelling is often found at about the level of the soil surface, together with a brick red discoloration within the root and often extending well up into the stem. This is a soil-borne disease, for which there is, as yet, no chemical control. Here again it has been found that some varieties are resistant to the disease[3] and can, therefore, be sown on infected soil; otherwise a gap of at least eight years is required if the infection is to die down to a safe level.

The use of healthy seed, treated with a reliable fungicidal seed dressing, and the practice of good rotation, together form the principal means of defence against disease, while in certain cases resistant varieties also play their part. Where fungus diseases have been particularly heavy, it may be wise to avoid sowing peas in the following year on adjoining fields, since wind-borne spores may again cause trouble in the vicinity of the original source of infection. Heavily-stained seed should not, of course, be used; most stained pea seeds will produce seedlings infected with leaf and pod spot.

Wherever either pest or disease attack cannot be readily identified, further advice should be sought without delay, because not only the existing crop but future crops too may be severely reduced.

Planning ahead

The capital expenditure involved in harvesting, vining and processing plant and machinery is such that it is essential to be able to deal with the greatest possible acreage of peas in the all-too-short season. The continuing expansion in mechanization has done much towards this end, and many viners now deal with well over a hundred acres of peas a year.

The combined effects of the cutter windrower and pea loader, in the field, together with grab feeder, feed regulator, automatic weighing and bulk handling of the vined produce, have succeeded in speeding the harvest and, at the same time, reducing labour requirements[8]. Careful planning is nevertheless essential from beginning to end[9] if the viners and factory plant are to be kept working to capacity for as long as possible. The relative earliness and lateness of districts, farms and individual fields must be taken into account when working out the sowing programme, if excessively large acreages are not to reach maturity together; while the method of controlling sowing must be carefully worked out between grower and processor, and alterations in the light of events made only after joint consultation. The vining pea season is seldom easy, but difficulties can be greatly reduced if there is a spirit of planned co-operation throughout. Success depends upon team work among farm workers, the growers and the processor; without it, a difficult task may soon become impossible.

Early planning is of equal importance to the individual growers. As soon as it is decided which fields are to be cropped with peas, consideration must be given to cultivations and manures. Peas prefer well-weathered, friable soil, and are most likely to fail on poorly-drained land. Their fertilizer requirements are not great, but any deficiency of potash must be put right if the maximum yield is to be obtained. Where farmers' records prove inadequate for the reasonably accurate assessment of the fertility of a field, soil analysis should be requested and fertilizer applications judged accordingly.

Summary

The growing of vining peas calls for careful planning and full co-operation between growers and processors; the selection of a suitable range of varieties, together with controlled sowing and up-to-date methods and machinery can greatly increase the throughput of the viners, while constant vigilance on the part of the growers and fieldsmen can ensure the highest possible proportion of good crops, free from weeds, pests and disease.

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1. Technical Memoranda Nos. 1, 2, 4, 6.
2. Annual Report, 1960, p. 17.
3. Miscellaneous Publication No. 7.
4. Annual Report, 1960, p. 16.
5. Technical Memorandum No. 5
6. Miscellaneous Publication No. 6.
7. Annual Report, 1960, p. 18.
8. Pea Picking Progress, A. J. Gane, Practical Power Farming, July 1961.
9. Miscellaneous Publication No. 9.

With the exception of No. 8, *all the publications referred to are issued by the Pea Growing Research Organisation, Ltd.*

Looking at Sicily

W. E. SHEWELL-COOPER, M.B.E.

Director of the International Horticultural Advisory Bureau, Arkley, Herts.

A FORTNIGHT spent visiting the farms and market gardens of Sicily is a revelation. It is an island of complete contrasts, and, I think, the most fascinating I have ever visited; and readers of *Agriculture* will know that I have reported on almost every island which sends horticultural products to our country. Drive into the centre of the island and you come to a desert like that in Nevada (U.S.A.), with large cacti growing abundantly. Drive down into the plains around the coast and you can find perhaps the most intensive market gardens in the whole of Europe. Some of them reminded me of the *jardins maraichers* around Paris; only, of course, in Sicily hardly any glass is necessary or seen. The rolling country around Partinico is literally clad with vines, and the wine produced reaches 18 degrees of alcohol. If only someone would take in hand the wine production (which at the present time is done rather poorly), there would be some wonderful wines to put on the British market.

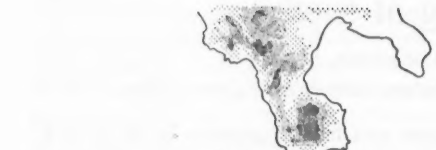
The island is divided into nine provinces, each with its own Prefect, and inspectors and advisers. There is, however, a Director of Agriculture for the whole island. A province like Syracuse, for instance, has 15 agricultural and horticultural advisers. These men are employed not only to give occasional lectures to farmers but also to inspect the produce being exported and to deal with applications for grants.

There is no doubt at all that if Britain were to join the Common Market, and if no restriction at all was placed on horticultural imports, vast quantities of vegetables and fruits could be produced very cheaply in Sicily for marketing in this country. At the moment, the bulk of the tonnage of lemons, oranges, mandarins, grapes, salads, new potatoes, cauliflowers and tomatoes are exported to West Germany, but even now the bitter oranges, lemons, shelled almonds and many railway wagons full of new potatoes are exported to England.

I had the privilege of visiting the farm of the President of the National Farmer's Union for the Island, Dr. Gianstefano Corvaja. At the time he was harvesting almonds, and the women were working hard from 5.30 in the morning until 6.30 at night for the equivalent of 12*s.* 6*d.* a day. The women not only do the picking but sit down afterwards at tables and do the de-husking as well.

Tomatoes in Vittoria

I drove over to the beautiful plain of Vittoria, which lies below the magnificent mountainous town of Ragusa. Here I found tomatoes being grown in the open on hundreds of acres. The sowing of seeds, where the plants are to grow on the sides of furrows, is done in November and the fruit is ready to pick in April. At the moment, because poor types of varieties are being grown, they are picking at only about 1½ lb per plant, for which the grower gets about 7*d.* a plant. Dr. Luigi Pironti, who farms about 500 hectares in that



Sicily

area, told me that the weight of crop could easily be doubled if British varieties like Money-maker could be introduced.

The growers there make up hotbeds with the dung collected from the towns, and having sown the seeds, two straw mats are put over the top. These are gradually removed as the plants grow, first of all being put up like a tent and then erected like a hedge to give protection against the winds. The baby marrows (courgettes) grow extraordinarily quickly. The seed is sown in the open, again where the plants are to grow, and when the seedlings are through protection against the hot sun is given by using one of the large "leaves" of the Opuntia, the cactus which is used as a hedging plant in that district. In 20 days the plant is growing well and the leaf is removed.

Of course, as in other islands I have visited, water is the outstanding problem. However, men like Signor Sebastiano Campisi, (who, with his brother, farms some 300 hectares in the Syracuse province) have found the answer. He has sunk fifteen artesian wells which are producing all the water needed. He is a great employer of labour, the men being paid the equivalent of about 13-15*s*. a day. During eight months of the year he may easily employ 600 people, although of these, he told me, only 100 are regular. He markets his crops in Rome, Milan, Bologna and Western Germany. Some go in refrigerated trucks and others in covered railway trucks, returnable containers being used throughout. He lamented the present shortage of refrigerated wagons.

Signor Campisi said that the great secret of his high production is the bare fallow which is always introduced between June and September. When he takes over new land, he likes to break up the chalk pan which lies some three or four feet down. He thus introduces special deep ploughs which bring up what appear to be huge boulders. The cost of treating the land in this way is as much as the cost of the land itself, but it pays dividends every time. Without adopting the special methods of the Vittoria area, he is able, by planting early, to pick tomatoes outside around the second week of May, the whole crop being cleared by the end of June.

Flowers and fruit in abundance

Commander Guilio Perotti, of Torre Andolina, told me laughingly that the British had given him three "baths" during the war, for three times the warship he commanded had been sunk by the British navy! While his ship was in port he met the daughter of Baron Pizzuti and married her. He has thus become a farmer and grows lemons, oranges, artichokes, peppers, almonds, olives and tomatoes. He thinks that the future lies in canning and

he is putting up a large canning factory on his farm capable of producing 10 million kilos of 5 and 1 lb tins. These can be dispatched all over Europe without any difficulty.

It is undoubtedly true to say that given modern varieties, more artesian wells and helpful advice, thousands of tons of vegetables and salads could be exported from Sicily in perfect condition. And not only vegetables and fruits; all kinds of flowers do extraordinarily well out of doors. Never before have I seen beds of tuberose in full flower doing so well as they were on the flower farm of Signor A. Cannata, of Isolo. The tuberose are in 3-feet wide beds with the plants a foot apart. The beds themselves are 6 inches below normal soil level, so as to allow for ease of irrigation.

Perpetual flowering carnations were growing on this farm in the tens of thousands in 3-feet wide beds, a foot being allowed on each side of the beds for irrigation channels. November- and December-flowering chrysanthemums grow out of doors, trained fanwise and held in position by two bamboo sticks tied on either side of the plants parallel to the ground 2 feet high. These bamboos, which run parallel to one another, are 2 inches apart and there are posts every 4 feet supporting the bamboos. By planting a ridge and training the plants like fan-shaped trees it is possible to have water flowing on either side. Signor Cannata told me that if he plants on July 1st, the chrysanthemums are ready to be marketed on November 1st.

To grow more and more peaches, many landowners are terracing the hillsides. Dr. Brogna Salvatori, of Carlentini, for instance, is terracing some 200 hectares, the terraces being about 12 feet wide and about 5 feet high. The provisional work is done with bulldozers, then the local stone is used to fill the buttress walls so that the mountainside looks like a series of huge steps. If this work continues, as it undoubtedly will, more and more of the mountainous areas will be brought into high-class cultivation.

But the fruit growers will have to adopt more modern methods of pest control than some of those I saw in use. For instances, in the area owned by Colonel Galtano Inseera, of Saleta Pisano, I saw large igloo-like tents being put over orange trees in order to fumigate them as they set against cochineal beetle. A large basin is put under the tent which is then filled with H_2SO_4—2KCN is then put in and the tent flap tied down. Thus K_2SO_4 is produced plus HCN gas, and this kills the cochineal grub. It can be imagined how long this tent erection takes and how dangerous is the use of the sulphuric acid, to say nothing of the cost to treat an acre!

Encouragement for smallholders

Much is being done to encourage the use of land by smallholders, and I was taken to a huge farm that formerly belonged to Prince Enrico Grimaldi. Some 200 hectares of his land have been divided up into holdings of $1\frac{1}{2}$ hectares each (just over 3 acres). Farm labourers take up a holding, on which they continue to work for ten years for a local farmer. After the first five years they get some return if they grow the Moro variety of orange, planting 600 to the hectare. At the end of ten years the land should be cropping so well that they can become independent. It seems to me that flowers could be grown cheaply over a wide area and flown to other parts of Europe. On the other hand, because Sicilians will live packed together in towns on top of

mountains, the whole of the countryside is deserted from about half past six onwards. Because, too, of their congested living conditions, they cannot keep pigs or chickens. Eggs and bacon have to be imported.

The peasants are hard working, kind and loyal. They are most hospitable, and wherever my wife and I went presents were showered upon us. But the Sicilians hate changes, and this is said to be one of the biggest problems that the agricultural organizers will have to face in the future.

I should like to thank all those who helped me in my researches. First of all His Excellency, the Italian Ambassador in London, Signor Pietro Quaroni, Dr. Georgio Fois, the Head of the Italian Institute for Foreign Trade in London, the Prefect of Syracuse—His Excellency Dr. Ferucio Scolaro, the Head of the Provincial Agricultural Advisory Centre, Dr. Giuseppe Carfi; Dr. Giovanni Alfiere, the Assistant Agricultural Adviser, who gave up many days to travel around the Island with me and Dr. Salvatori Gibellino, the Assistant in the ICE office in Syracuse. I would also like to thank the number of Assistant Horticultural Advisers in the provinces who went out of their way to provide information when needed.

UNIVERSITY SCHOLARSHIPS IN DAIRY SCIENCE

As the first major step in an educational programme, the dairy industry is offering scholarships to universities for courses in dairy science or allied subjects.

It is hoped that in the first year (academic year 1962) four scholarships will be awarded, two tenable at the University College of Wales and two at the University of Reading.

Applications for these awards will be considered not only from school-leavers but from men and women already employed in the industry. The maintenance allowance will be £330 a year, without means test.

A brochure giving information about these scholarships and the conditions under which they will be awarded, together with the application forms may be obtained from the Secretary of the Joint Committee of the Milk Marketing Board and the Central Milk Distributive Committee, Giggs Hill Green, Thames Ditton, Surrey.

Cereal Root Eelworm in North Wales

T. GLYN DAVIES, M.Sc.
National Agricultural Advisory Service, Bangor

The trouble with this pest has mainly been in Flintshire, following too many white-straw crops during the war.

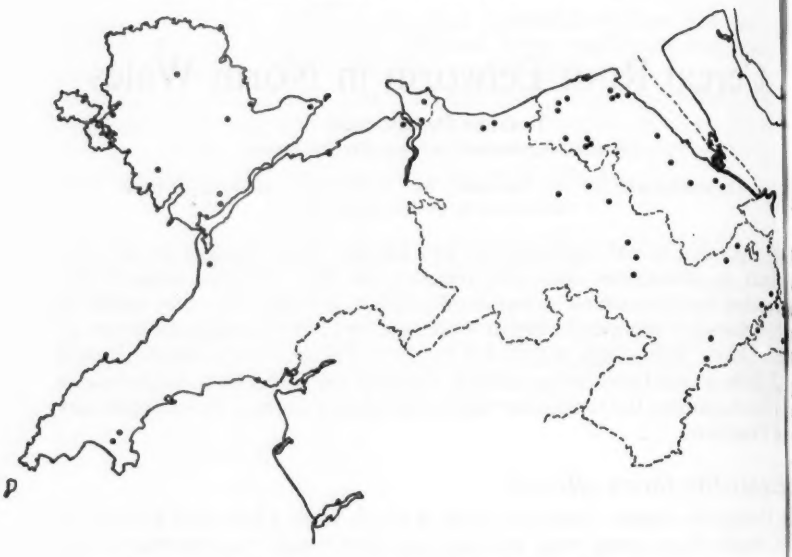
THE fact that cereal root eelworm was causing severe damage to oats and wheat in Shropshire was first reported in 1933. Further observations revealed the eelworm to be well-established in this area. The first record of the eelworm's presence in North Wales was in 1943 in an adjoining part of Flintshire[1]. This single record led to a small-scale survey, which showed 42 fields on ten farms to be infested. Three of the farms were isolated cases in Denbighshire, the remainder were in the Maelor district, the detached part of Flintshire.

Eighty-five farms affected

During the course of advisory work in North Wales I have kept a record of all fields where cereal root eelworm has been noted. The presence of the eelworm was confirmed either by a visual examination of the root systems of plant samples to determine the presence of eelworm cysts or by extracting the cysts from a soil sample taken by a standard method of sampling. No large-scale survey work has been attempted. The complete record now shows the eelworm to have occurred in 149 fields on 85 farms. The distribution of the farms is illustrated overleaf. Eight of the farms were in Anglesey, 7 in Caernarvonshire, 15 in Denbighshire, and 55 in Flintshire. The majority of the farms were in the detached part of Flintshire. Elsewhere there was a rather scattered distribution in the main part of Flint, a few farms in the Clwyd Valley and coastal plain of Denbighshire, a few in the coastal area of north-east Caernarvonshire, two in the Lleyn area of Caernarvonshire, and some isolated fields in Anglesey. The majority of the cases were noted during advisory work on crop damage, so the distribution does pin-point the areas where the pest is most troublesome.

Most root eelworm damage occurred to the oat crop, which is the main cereal grown in the area; barley was less affected. The acreage of wheat and rye is small, and no case of damage to these crops has been noted. The trouble has flared up since the war, due no doubt to the increase in war-time cereal acreage. Evidence points to the eelworm being particularly serious in run-out arable fields that had been over-cropped with cereals.

Damage to oats was usually seen as patchiness in the crop; but quite often the whole field was affected. The plants were short, stunted and pale yellow, with practically no tillering and a shallow, much-branched root system. The effect was generally similar to that of severe nitrogen deficiency. From late June onwards the presence of the eelworm could easily be seen by the newly-formed cysts on the root systems. These are white at first but later turn a brown colour. Not surprisingly, infested fields were generally overgrown with weeds, particularly couch grass, charlock and poppies. Such land was difficult to seed down, and a good clean sward was difficult to establish.



The distribution of farms in North Wales infested with cereal root eelworm

Soil and infestation levels

As in other districts damage was more pronounced in periods of drought and on soils of a light loam texture, low in organic content with free drainage. A classification on the basis of the soil texture of 120 infested fields in Flintshire has shown that 68 per cent of the fields were of a sandy loam or loamy sand texture. The majority of the soils classified were from the Maelor district, where the parent material was Bunter Sandstone and Keuper Marl and in some cases a glacial drift of mixed origin. These soils are light, with an adequate lime and phosphate status but low in potash and organic matter. Experimental work to determine the effect of different levels of fertilizer application to the yield of spring oats in the eelworm-infested soils has shown that a worthwhile increase in yield could be obtained only by applying a high level of nitrogen. Applications of phosphate and potash fertilizers had little effect on yield.

The degree of infestation of cereal root eelworm encountered in infested fields as indicated by the number of viable cysts per gram of soil is shown in the Table on p. 557 which classifies the infestation in 71 fields. The exact level at which crop damage can be expected is difficult to determine. This is influenced considerably by such factors as soil fertility (particularly the organic status of the soil), crop rotation, time of sowing, weather conditions and the presence of other pests and diseases. Under poor conditions a low level of infestation can cause damage, but generally serious damage can be expected in fields with a cyst infestation of 0·05 cysts and over per gram of soil.

Soil infestations in Flintshire

Number of cysts per gram soil	Number of fields
Over 0·31	8
0·21-0·30	4
0·05-0·20	27
Below 0·05	32

Farmers' control

Farmers with infested fields aim at controlling the pest, in the first instance, by widening the rotations to avoid taking cereals (particularly oats) too often. This is not always easy on small farms, but the local fall in cereal acreages has helped with this problem. Where it has been found necessary to take a cereal crop, the trend has been to mixed corn and more recently to barley, a crop more tolerant of the eelworm. Liberal applications of nitrogeneous fertilizer in the seedbed greatly help cereal crops to overcome attack, while most farmers build up the fertility of infested fields, particularly the organic status, by temporary leys. Generally speaking, infestations are reduced under leys, although grasses are known to be hosts of the eelworm. It is often difficult to establish a clean sward on the light infested soils, but grassing down with a good-quality ley mixture such as a meadow fescue-timothy-white clover mixture is generally satisfactory.

Reference

1. THOMAS I. BROWN, E. and WILLIS, R. J. (1946). The cereal root eelworm (*Heterodera major* (*O. Schmidt*) *Franklin*) in North Wales. *Ann. appl. Biol.*, **33**, 63-5.

★ NEXT MONTH ★

Some articles of outstanding interest

MECHANIZATION MANAGEMENT *by C. Culpin*

SPRING CEREALS AND FARM MANAGEMENT *by C. J. Black*

WATER *by G. W. Ford*

WORK STUDY IN HORTICULTURE *by A. P. Mitchell*

Farming Cameo: Series 2

45. Axbridge, Somerset

T. E. WATHAN, B.Sc.
District Advisory Officer

NORTH Somerset is an area abounding in historic interest, associated with tourism, strong cider and strawberries and cream, but essentially agricultural economically and in outlook.

Generally it can be said that the dairy cow reigns supreme, and milk production is the basic industry, but there are three distinctly contrasting farming areas in the district. These are the Mendips, the Lowlands, or Somerset Moors, and the intermediate undulating Keuper Marl areas.

The Mendips consist mainly of a ridge of Carboniferous Limestone rising to some 1,200 feet in altitude and extending from Shepton Mallet in the south-east to the Bristol Channel at Weston-Super-Mare in the north-west, including such well-known places as Cheddar Gorge and Burrington Combe. The massive limestone of the Mendips is topped by areas of deep lighter drift material, forming a plateau of large farming units with big fields divided by stone walls, and contrasting markedly with the surrounding lowland areas. The Mendip approach to milk production is generally governed by the necessity of the monthly milk cheque. The milking herd is looked upon almost as a necessary evil. Traditionally, and by inclination, there is a tendency to revert to rearing, which is being further stimulated by recent economic pressure. In some areas there is a welcome re-appearance of sheep. The use of the plough for reseeding and some arable cropping are accepted practices. On the southern slopes of the Mendips very useful Keuper Marl soils occur, and on these strawberry growing for the early market has developed extensively.

The Lowlands, or Somerset Moors area makes up more than half my district, and is by far the greatest problem. It consists predominantly of alluvial silt and clay soils, and there is also an extensive area of peat which has developed on the alluvial clay on the lower areas inland. The rivers Brue and Axe are the main water channels, and these meander sluggishly through extensive areas of flat land, mostly at below 20 feet O.D. Drainage is a serious problem, the main feature being open ditches, or rhynes, which additionally serve as stock barriers dividing up the fields, and as a source of drinking water for the stock. The lower areas are liable to extensive flooding, and, in consequence, the homesteads are erected in villages and hamlets on the rather higher areas adjoining the peats. This results in fragmented holdings and the treatment of the low-lying peat areas for summer grazing and hay only. With the emphasis on milk production, the traditional practice was to hand milk the cows in the fields during the summer months. In more recent years the mobile bail has superseded hand milking, but otherwise the pattern has changed little. In the winter the bails are in many instances returned to a hard standing near the homestead, and the cattle are run out of doors on the higher land.

Inadequate drainage is the chief bar to progress in these areas. Winter flooding has been an accepted seasonal factor, but some three years ago a vital development took place in the Brue valley, when a pumping station was installed. This has gone some way to relieving the position, but not far enough to make a major change of farming methods possible. The combined handicaps in the past have not encouraged improved farming techniques, but with the reduction of flooding dangers, and with a possibility of better water-table control in the area, there is scope for advancement.

Most of the peat is of the fen peat type, and these areas could become a second fenland if the water problem could be brought under the same degree of control as exists in the Eastern Counties; but this would involve considerable capital expenditure. The higher areas off the peat would justify greater investment in drainage works without the very heavy capital expenditure necessary on the moors themselves. Drainage, ploughing and reseeding in these better areas has increased considerably in the last few years, and this practice will no doubt spread to the lower and more difficult areas in due course. Better drainage, to extend the grazing season on the moors, would save these home pastures at critical times for the production of increased winter feed in the form of hay and silage, and result in general all-round improvement.

At this stage, alternative systems to milk production are not practicable in these areas, and subsidiary enterprises are generally inadvisable because of the small and fragmented nature of the holdings. In fact, it seems that further concentration on milk production is the only course of development open. However, there is plenty of opportunity for progress within this sphere.

The pre-war grassland survey credited Somerset with some of the best permanent pasture in the country. This may well have proved a disservice. A more recent economic survey by Bristol University suggests that the Somerset Lowland farmer is economically stable, and this tends to confirm the complacency.

A concentration on the churn, the acceptance of a simple system, and an absence of subsidiary enterprises and interests, have, however, bred a considerable local skill. Herd averages of 800 gallons are common and point to good selectivity of dairy cows. Feeding standards conform to the average of £20-25 per cow. With family labour and none of the overheads entailed in reseeding and fertilizing, margins can still be satisfactory, even on the 30-acre enterprise.

A degree of complacency may, therefore, be justified. But many farms are marginal by nature of their size, and many more will want to retain their standard of living in the face of future economic pressures. Until recently there was scope for increased stocking without effort. Now there are indications that the optimum stocking rate consistent with a permanent pasture policy has been reached. A further increase in stocking can only materialize with the introduction of better grassland management. As a general policy the next step should be to concentrate on drainage; a full response to increased fertilizer usage will then be possible. Ploughing and reseeding, not usually considered a necessity in the general pattern at present, will follow in time.

The Somerset Moors Group, a Sub-Committee of the South Western Regional Experiments Committee, was constituted some five years ago to conduct an improvement campaign. This Group, following a survey already published, initiated a programme of experiments within this area at Tealham Moor. These trials, involving water-table control and fertilizer effects on a field scale, will be followed by more extensive block drainage schemes. Economics and tradition, rather than technique, are expected to be the major obstacles to future development. These difficulties will be overcome.

The Keuper Marl soils, even in the 30s, could yield some economic return. The land is easy working, and the farms are biggish units with fair-sized fields divided by hedgerows. This is an area which has moved easily into new techniques and developments, and presents no major problems. It provides a welcome contrast to the rest of my district from the advisory angle.

Your Fixed Equipment

Modern Farm Building Materials

F. W. HOLDER
Agricultural Land Service

THE modern farm is a factory, and it is in this light that its construction and design must be considered. During the last war, shortages of labour and materials set a new style for buildings on Britain's farms. The picturesque stone and slate, brick and tile, and half-timber and thatch, gave way to simpler, more "functional" materials which could be put together quickly and easily, with the minimum of skilled labour. Thus was the "new look" born, by necessity out of scarcity, and with it the modern farm building has begun to express its own individuality as a tool of the industry.

The old traditional building materials have been tried and tested over the years and still have certain advantages over their modern counterparts. But against these must be weighed the speed of erection, flexibility and cheapness of the new materials. Perhaps the most significant visual change is in the use of asbestos cement as a cladding material. Here the manufacturers have taken every opportunity to widen and develop the scope of their products, and a generation has grown up which is scarcely aware that there could possibly be any alternative! But it is necessary to look further afield to possibilities being explored and new techniques being perfected.

The most significant modern developments in building materials are taking place within the plastics industry. Corrugated translucent roofing sheet is accepted nowadays as part of the language of farm buildings, and it is not unreasonable to expect that before long the material may compete more strongly with sheet glass. In the U.S.A., research is proceeding in its use for glasshouse work. In the same way, the plastic pipe has made its entry, first for water supply in the fields, and latterly for all types of plumbing, with a wide variety of fittings which formerly were associated only with metal.

Looking further into the future, it may not be too visionary to speculate on the use of plastic for the structural members of framed buildings. The humble "nylon" curtain rail may anticipate the gantry of the future, and this may be only a preliminary to a completely plastic structure to support it. Plastics are frequently used for internal and external walling in commercial buildings, and may well appear on our farms in days to come.

Again, there have been rapid strides in the development of uses for the waste from the timber industry, and the production of "reconstituted" boards, manufactured of sawdust and wood chippings bonded with modern glues, is on the increase. Indeed, it has been said that before long the sole use of timber will be to "mince" it for this purpose. The boards and panels which emerge from these processes have a wide range, from soft (for acoustic and insulating purposes) to very hard for external use or heavy duty. Many of these boards are obtainable with timber, metal or plastic veneered finish, and are already used extensively in the manufacture of joinery and furniture.

Developments with non-ferrous metals, accelerated during war-time, have resulted in a number of new types of cladding sheet at reasonable prices and

with interesting possibilities. These can add variety to the appearance of farm buildings and help solve some of the aesthetic problems cropping up when designing in harmony with environment.

Steel, concrete and timber are well known and accepted as building materials without comment, but today something more than the strictly utilitarian is needed. Manufacturers are aiming at lightness, clean lines, and a reduction of the maintenance problems which some of the older, more complex structures presented. The use of welded steel tubular sections and the highly-finished concrete unit on the one hand, and the laminated plywood frames on the other, all point towards an appreciation of the essential need for speed and simplicity in construction, combined with economy in material.

Among the traditional bricks and building blocks (clay or concrete), research is proceeding, and a number of varieties of these are coming on to the market which provide extra insulation together with lightness in handling.

When considering all new materials, it is essential to take account of the reasons for their development and the trends of future building techniques in which they will be employed. There is little doubt that in farm buildings, as in the wider fields of construction, the factory-made component will find increasing scope.

High labour costs, and the periodic shortages of traditional materials, have made it necessary to consider ways of eliminating the laborious and cumbersome building methods of the past. The slow ascent of brick upon brick, with all the labour problem which this entails, the elaborate assembly of formwork for reinforced concrete, which, once used, is more often than not thrown on to a bonfire; these practices are being abandoned in favour of the large walling unit. Such units can be made to suit the requirements of a building as regards permanent interior and exterior finish and insulation properties. They are factory-made, and can be brought to the site and erected with the minimum of labour, requiring no further attention once they are in position.

The sheeted roof, of asbestos, steel or aluminium, is an obvious example of this new trend. The myriad operations involved in constructing coverings of tile or slate, have been simplified so that certain types of metal sheet can be laid in lengths up to 18 feet on a roof slope and others can be rolled along the length of a roof like linoleum on a floor. These coverings require the simplest of supports; thus the problem of maintenance is greatly reduced.

Surface finishes in farm buildings are a constant source of expense. Repainting metal and woodwork, repairing cracked or broken cement rendering of floors and walls, are tasks which, if not done, lead to further decay, and in time complete replacement may be necessary. It is now possible to obtain certain materials such as asbestos-cement or concrete, with "built-in" coloured or textured finishes. Aluminium is obtainable in various colours, whilst timber can be pressure-treated with preservatives which eliminate the need for periodic painting. The high costs of present-day building make it essential that as little money as possible needs to be spent on it thereafter. Farm buildings get rougher treatment than most, so it is all the more desirable that their designers should consider this when selecting materials.

The "forward look" in agriculture is the order of the day; new materials and new techniques in farm buildings will help to achieve this.

At the Farmers' Club

Four Ways To Beef

BEEF production can be managed in a number of different ways, utilizing a variety of feeds. At the Farmers' Club on 13th December, four systems were described, two conventional, two experimental.

The first speaker, MR. DENNIS G. BROWN, farms 1,300 acres on Tweedside, using the alternate husbandry technique; 5 years arable, including 4 cereal crops, followed by 3 years ley. Cattle bought in spring are fattened on summer grass and on arable by-products in winter. Mr. Brown's favourite short ley is predominantly timothy, meadow fescue and white clover. This should produce 6-7 cwt per acre liveweight gain in an average season. Believing in variation from ley to ley, Mr. Brown also advocates, for a change, a mixture of 18 lb cocksfoot, 5 lb meadow fescue and 2 lb white clover, stocked by 2 cattle and 10-12 feeding sheep per acre. He uses the mower "pretty well continuously" throughout the season to top the grass and maintain a good short, leafy sward, applying the bulk of the fertilizers in mid-rotation to the green crop. "In recent years I have vastly increased my nitrogen dressings, and do not seem to have retarded the clovers", he said, adding "not that I think a stand of clover is essential—the leafy strains of modern grasses are as valuable as any excessive stands of clover." Expressing some doubt as to the economic soundness of the 10-11 cwt bullock sold fat at around £80, Mr. Brown remarked that practically every farm animal except the beef bullock has come under the eye of research and concluded "It is high time that more work was instigated on the production of good beef".

MR. JOHN YOUNG, who farms 800 acres in West Norfolk, then described how, in the Eastern Counties, cattle feeding has followed the changing pattern of arable cropping, utilizing whatever by-products are available. Today, beef is produced there mainly from black and white pure-bred or cross-bred stores, fed on beet pulp and tops, vegetable residues and by-products from vining peas.

"Indoor broiler beef operations, with young cattle fed right through to slaughter on concentrates, do not generally meet our requirements", he said. This type of baby beef production is a possibility as a specialist venture, but definitely not one to fit in with the average East Anglian arable farm. "For us, there is no single fattening system of general application." Grain feeding has limited use, and winter storing of bullocks and grass fattening is not possible in our dry climate on light land. It is doubtful whether mechanical feeding with maize silage, auger feeding mechanisms and costly silos have a place here as strictly commercial propositions. But the use of dry feeders, giving access to feed at limited times, and using chopped straw to dilute concentrates, alternating with various by-product feeds, may have a future. Mr. Young has been using this system for some time, mainly for breeding stock, and has found it satisfactory.

The Rowett Research Station has formulated a new and truly intensive system for beef production, based on high-level cereal feeding. DR. T. R. PRESTON said that the aim was to make maximum use of concentrates to

ensure the fast growth rates necessary for rapid turnover and high feed conversion efficiency. Self-feeding is desirable for it permits higher density stocking and reduces labour costs. Dry feeds which can be ground and mixed are easier to convey mechanically and more readily self-fed than succulent or bulk feeds.

Initially, the concentrate proportion in the feed was limited to 60-70 per cent (using maize, oats, barley and high protein meal). The remainder was roughage, e.g., dried grass, hay or straw, ground through the half-inch screen of a hammer mill, plus oat dust and husk. Early weaned beef, cross-bred and dairy steers raised on concentrates and hay, started this special diet at 90 kg. live weight, and reached slaughter weight—400 kg.—at about 14 months. The roughage element made this feed costly, so an alternative originally suggested by an American feed company, was tried. This consists in processing barley so that the husk remains intact to supply the roughage while the starchy centre of the grain is exposed to serve as concentrate. The Americans do this by "steam-rolling" but at the Rowett dry-rolling has proved satisfactory, provided the grain contains not less than 16 per cent moisture (18 per cent is best). On this feed (87·5 per cent bruised barley, supplemented with high protein meal, vitamins and minerals) 20 Friesian steers averaged 405 kg. live weight in approximately 12 months, gaining 1·2 kg. a day. Dr. Preston advocated caution in interpreting these "very preliminary results", adding "the next few years will decide whether these ideas have application in the business of making profit from beef cattle".

In feeding trials with maize silage carried out at Harper Adams Agricultural College for the past two winters, a daily liveweight gain of approximately 2½ lb has been achieved with Hereford cross bullocks at a cost of 1*s.* per lb. MR. R. G. MORTIMER said that in both years the main ration was 80 lb of maize silage and 4 lb of low protein supplement. Increased rates of concentrate gave greater liveweight gains but were uneconomic.

Maize can out-yield any traditional root crop in terms of dry matter and feed per acre, producing some 5 tons of dry matter in 4-5 months, and more if preceded by a short ley, say S.22 ryegrass, for early bite or an early silage cut. Mr. Mortimer said that the cattle took maize silage readily during the fattening period January to March. Carcass gradings were satisfactory in both years, fat colour was excellent and kidney fat notably very low. Returns averaged around £85 per animal in 1959/60 and over £90 in 1960/61. In the second year the animals were fed mechanically, using American equipment comprising a tower silo, an unloader and an auger feed. This set-up is well adapted for conserving and utilizing fodder crops—nutrient losses in a tower silo are only 10 per cent compared with 30-40 per cent typical for trench or horizontal silos. Further co-operative research is needed to check whether this system of mechanized feeding is generally applicable under British farming conditions.

SYLVIA LAVERTON

THE MINISTRY'S PUBLICATIONS

Since the list published in the December, 1961, issue of *Agriculture* (p. 508), the following publications have been issued.

LEAFLETS

Up to six single copies of Advisory leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 5d.).

ADVISORY LEAFLETS

No. 118. Dairy Goat Keeping (Revised)

No. 247. Quality in Seeds (Revised)

No. 419. Spinach (Revised)

No. 503. Manuring and Liming Gardens (New)

No. 505. Swedes and Turnips (New)

No. 506. Top Fruit in the Garden (New)

No. 509. Wilting for Silage (New)

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops (addresses on p. 572), from any Divisional Office of the Ministry or through any bookseller at the price quoted.

BULLETINS

No. 151. Carnations Under Glass (2nd Edition) 4*s.* 6*d.* (by post 5*s.* 0*d.*)

This new edition deals with the culture, packing and marketing of carnations, and gives a selection of the new varieties suitable for commercial cultivation. The chapters on the techniques of propagating and growing carnations, also on the methods and materials for the control of pests and diseases, have been substantially rewritten. The section on marketing has also been revised.

No. 65. Protected Cropping (Revised). Formerly published as *Crop Production in Frames and Cloches*. 6*s.* (by post 6*s.* 6*d.*)

Describes the use of glass or glass substitute in cloche, frame or greenhouse, and the systems of intensive cropping practised at the present time.

OTHER PUBLICATIONS

Chick Embryo Development Chart. (New) 3*s.* 6*d.* (by post 3*s.* 10*d.*)

Shows in full colour 39 carefully prepared photographs of eggs broken out at different stages of development. The appearance of the embryo at each stage can be clearly seen.

Toxic Chemicals in Agriculture and Food Storage (New) 4*s.* 6*d.* (by post 4*s.* 11*d.*)

Report of the Research Study Group.

Weather Reports and Plant Diseases

A LOT of work has been done in recent years in interpreting the relationship between weather conditions and the incidence of plant diseases. Co-operation between pathologists and meteorologists has established and tested in practice certain criteria which have proved to be of great use in the forecasting of infection and in the planning of spray programmes. As a result, farmers and growers are asking for notification of such critical weather. Accordingly a new system is being introduced this year whereby anyone can be advised by telegram when specified weather occurs at any one reporting station for an inclusive charge of £2 10*s*. per season.

The specified weather is based on the hourly reports made by official stations which are open continuously, and is defined as:

1. *Smith Periods* (available May 15th to May 31st)

These are counted by the number of hours following rain when the relative humidity is 90 per cent or above; the mean temperature during this period is also stated.

2. *Beaumont periods* (available May 15th to August 15th)

These consist of a period during which the temperature is not less than 50°F and the relative humidity not less than 75 per cent for at least 46 out of 48 consecutive hours.

It is very important to note that these are statements of meteorological conditions only and that they refer solely to the place of observation.

Anyone wishing to take advantage of this service must first write to the Meteorological Office, M.O. 7 (c), London Road, Bracknell, Berks. He will then be advised what stations, if any, are available in his area and some indication will be given as to whether such stations are a fair representation of conditions in a particular farm or orchard. In some cases, owing to the absence of nearby reporting stations, or to the variations in weather conditions over relatively small distances, it may not be possible to offer a reliable service. This is likely to be the case in Kent and in parts of Scotland. Once a station has been accepted and the fee paid, the applicant is placed on the distribution list for telegrams originating from the station which has made the observations. The fee is therefore per station, and notifications from two stations cost £5. The single fee of £2 10*s*. covers one type of service only, that is, either a supply of Smith periods or Beaumont periods, but not both.

Smith periods are intended to be of use in relation to apple scab, but the issue of a telegram does not imply a significant infection period. The details in the telegram must be considered in relation to the Mills criteria. Furthermore the presence of ascospores, the state of the trees, and the time elapsed since the spray application all have to be taken into consideration. Growers are, therefore, strongly recommended to seek advice from the pathologists on these points. The new service is in no way a disease forecasting service and must not be interpreted as such.

Beaumont periods are linked to potato blight problems, but the same cautionary remarks apply. The time of the occurrence of a Beaumont period, the state of the potato crop, the presence of primary foci of infection all need careful consideration and here again professional advice is invaluable.

In short, the new service is not complete in itself, it merely provides in a convenient and relatively cheap manner a new aid to farmers and growers which, if used intelligently, can help them in the control of plant diseases.

L. P. SMITH

In Brief

MILK QUALITY AFTER THE COOK REPORT

In a written reply to a Parliamentary Question on 8th December, the Minister of Agriculture referred to the Report of the Cook Committee on the compositional quality of milk in the United Kingdom. He said that this report drew attention in the main to the decline in the solids-not-fat (S.N.F.) content of milk in England and Wales over the past thirty years or so. "Although the decline has been small," he said, "the Government agree that it is desirable to maintain, and if possible to improve, the compositional quality of such an important article of food. I am glad to say that the Milk Marketing Boards and the distributive trade have endorsed this view.

"The Government accept the Committee's recommendation that compositional quality can best be maintained and improved by paying the milk producer according to the compositional quality of his milk. Discussions are at present proceeding on the detailed operation of differential payment schemes to take account of the need to maintain s.n.f. levels.

"The Committee also recommends that, in due course, consideration should be given to introducing minimum legal standards for fat and s.n.f. in lieu of the present presumptive standards. This may be desirable at a later stage but we think it best to await an improvement in compositional quality resulting from the operation of the new differential payment schemes.

"The Government agrees with the recommendations that the use of the Hortvet test should be accepted in legal proceedings as proof of the presence or absence of added water in milk. A number of technical points have to be worked out, but when these are resolved the necessary legislation will be proceeded with at the first suitable opportunity.

"My Rt. Hon. Friend the Secretary of State for Scotland and I are considering whether some body, such as the Cook Committee recommended, should be appointed to keep Ministers informed of developments affecting milk composition and to advise them when action appears desirable. I am informed that in Northern Ireland existing arrangements for this purpose are considered adequate."

BUILDING IN TIMBER

A strong plea for renewed interest in timber buildings comes from Mr. Henry Hooper of the North Wales Conservancy, Forestry Commission, in the November issue of the *Journal of the Chartered Land Agents' Society*. He says that building in timber in Britain has declined almost to the point of non-existence since the eighteenth century, and attributes this to the increased production of cheap brick which followed industrial development. Other countries, such as Canada, the United States, Sweden and Switzerland, have not lost the art or abandoned this tradition. That a timber building can be durable is evident from the many examples that are still standing after 300 years, and Mr. Cooper also points to the main walls of Greenstead Church, in Essex, which date back to Saxon times.

"The fallacy, common today in England, that a timber building is a temporary building," says Mr. Hooper "probably originated from the wide use of the material for low-grade structures such as military camps." "On the other hand," says Mr. Hooper, "modern needs do not usually demand that a building should be constructed to endure for centuries. Planning requirements and internal equipment change so quickly that a contemporary building may soon become obsolete. In general, half a century of useful life is probably all that is expected from most

buildings in these days. Costing less to build, renovate, remodel, move or dismantle, a timber building is the most "economically" durable structure which can be built.

"For modern developments we must look almost entirely overseas: to Sweden, where the ultra-modern ideas of lightness and flatness are given full scope and find happiest expressions in wood: to Japan and Finland and, above all, the United States. In America the wood-built home is a symbol of comfort, from the elegant proportion of the spacious architectural mansions to the succession of small towns and villages with their comely, white-painted wooden buildings settled on smooth green lawns.

"One of the most impressive facts about timber is its adaptability to the modern planning methods: the wide spans and the flexible plan forms of modern buildings might well have been evolved for a timber style, rather than for steel or concrete. Timber does not limit architectural forms to certain set patterns and it can provide a smooth and agreeable elegance."

Medical opinion in North America is quoted as being practically unanimous that a properly constructed timber house is the healthiest type in which to live—always drier than brick houses, cooler in summer and warmer in winter. Mr. Hooper also makes a point about the saving in cost, which he puts at 10-15 per cent.

The use of timber for farm buildings, farmsteads and the housing of farm workers is an obvious corollary of all that Mr. Hooper says. Mr. F. W. Holder, the Ministry's Chief Architect, will be writing about the use of home-grown timber for houses in the next issue of *Agriculture*.

PROFITABLE PIG BREEDING FOR BACON

Those responsible for the pig unit at Somerset Farm Institute, keep a steadfast eye on the production of profitable bacon pigs. Mr. A. J. Marval, the Vice-principal, writes about their methods in the December issue of *Pig Farming*. Take the all-important matter of feeding the breeding stock, for example. This, he says, is carefully controlled, with dry sows receiving 4-7 lb of sow-and-weaner nuts daily (according to the abundance or otherwise of the grazing available), until within two or three weeks from farrowing. The sow is then transferred to her farrowing quarters in a small, individual paddock. There her diet changes to dry meal, the quantity being adjusted (if necessary) so as to farrow her in a firm, fit condition.

The same sow-and-weaner type of meal of our own compounding is next offered as a creep feed to the litter at three weeks of age, when they are also weighed, ear-marked, and the males castrated. In this way we manage to maintain an average weaning weight for all pigs, winter and summer farrowed, of 40 lb.

The Institute's 1960-61 figures are worth quoting:

Average number of sows	16·5
Average number of litters per sow	2·1
Average number born per litter	10·8
Average number weaned per litter	8·6
Total baconers sold	316
Total income	£5,375
Total cost of food (purchased and home-grown)	£2,904
Food conversion rate	3·08

It may be added that, to get results such as these, a ruthless culling policy is applied to breeding stock. Sows which produce small, weakly litters, rear their litters inadequately, or lose valuable time between litters, are promptly removed.

NOT DOING IT YOURSELF

The Farming Year and the Contractor, published by the National Association of Agricultural Contractors, presents in an amusing readable way the services that contractors provide for farmers. Copies, price 1*s.* each (plus postage), may be obtained from the N.A.A.C., 140 Bensham Lane, Thornton Heath, Surrey.

IN BRIEF

RIGHT GRASS FOR THE RIGHT SHEEP

Mr. N. J. Merridew, of King's College, Newcastle, speaking at Ryedale, emphasized the potential of well-managed sheep. In a recent survey, nine flocks averaged £81 gross output per acre. He compared this with a normal sheep system showing £25 per acre, corn at £45 and potatoes at £100.

It is essentially a system for early fat lambs (or the majority as such).

Key requirements:

Clean ground: i.e., no sheep on the land the previous season.

Fecundity: if the lamb crop is increased by 15 per cent then the costs may drop by as much as 5*d.* per lb dead weight.

Small-type ewe: numbers of lambs (and ewes) grazed per acre greatly reduced costs. There is no need for a large-type ewe to produce 40 lb carcass lambs.

Short lambing period: all lambs intended to be used on creep grazing should be in a narrow age range, entering the paddocks as young as possible, otherwise they do not readily learn to creep. Three weeks of age seems to be the upper age limit for entry.

Dense stocking soon taints the herbage in the ewe block, thus lambs are encouraged to seek succulent grazing by forward grazing the next block. Creeps were at 50-yd intervals, vertical at first and then with alternate stakes removed, a top-and-bottom horizontal rail 9 in. above ground with 15 in. gap to bottom of top rail. The lambs can negotiate these whilst even clipped ewes fail. Rotation should be at approximately 3-week periods.

Mr. Merridew recommends generous fertilizing, and a water supply which is readily transferable to each of the ewe paddocks is essential. A 2-cwt dressing of nitrogen in early June is also advocated. The grazing on the first round could almost be described as "foggage". Making the ewes graze *bare* the first and subsequent paddocks before going forward is of the utmost importance, otherwise the regrowth will not be acceptable to the lambs.

Grass 4 inches long is the right length for lambs to move on to, and the initial stocking rate must be heavy to allow for fast regrowth in May.

The paddocks are cleared in early July and the herbage allowed to grow away. This highly-manured field then provides a high dry-matter silage in August and, the aftermath of this, an excellent field on which to flush the ewes four days or so before freeing the ram.

Be kind to the ewe in winter, said Mr. Merridew, and hard on her from four weeks after lambing. He does it by feeding the high dry-matter silage on grass during the winter.

AWARD TO SIR JOHN RITCHIE

Congratulations to Sir John Ritchie, Chief Veterinary Officer of the Ministry of Agriculture, who is the first recipient of the Bledisloe Veterinary Award. Sir Robert Gooch, retiring President of the R.A.S.E., made the award (a cup and a silver medal) at the Society's Annual General Meeting, for Sir John's outstanding work on the eradication of bovine tuberculosis.

QUOTE

"What a fountain of blessing is the cow! She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe-horns, hair combs and upper leather. A gentle, amiable, ever-yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children that we may rob her of her milk and we only care for her that the robbing may be perpetuated."

The first issue of the Journal of the British Dairy Farmer's Association, 1877.

Book Reviews

Municipal Composting. A. G. DAVIES. Faber and Faber. 30*s*.

The current knowledge on the subject of municipal composting is "factually and fairly" reported in this book which maintains that it is the positive approach to the disposal of those by-products of urban life, household refuse and sewage sludge. After defining briefly the process of composting the author describes, in detail, the various systems and the particular plane and organizations in operation throughout the world producing physically acceptable and pathogen-free composts. Municipal composting can never be a completely standard process because of variation in the character of the refuse from country to country, town to town, and load to load. Mr. Davies emphasizes the difficulty of verifying the claims made about the advantages of certain systems, due to insufficient data. The comprehensive information assembled in this section and the chapter on economic factors and sales considerations will be of particular interest to local authority engineers and councillors who may be considering the practical complications associated with composting.

The chapters covering the agricultural and horticultural value of municipal composts are less authoritative to the specialist, though this may not apply to other readers. Overlooking loose terms like the use of "texture" for "tilth condition", "chemicals" for "nutrients", and "most important" trace elements for "most commonly deficient" trace elements, there is a mystical quality attributed to the composts in their effect on the soil. Unfortunately the paucity of scientific data on their efficacy makes comparisons impossible, and data from other countries, especially sub-tropical countries, cannot be directly translated to conditions in the United Kingdom. The utility of good-quality composts cannot be denied, but municipal composts command no special virtues over alternative products or techniques for improving soil physical conditions or the nutrient status. Indeed, the variability of the marketed product from the nutrient standpoint, and the content of glass, ceramics and heavy metals, may be disadvantageous. Economic, in addition to technical considerations, must determine the choice of any product or technique used by commercial farmers or horticulturists. Horticulturists and amateur gardeners will be the main users of municipal composts.

Mr. Davies develops a convincing case for municipal composting as a satisfactory alternative to other methods of disposal of town wastes, but the resultant compost will then be sold on merit in a competitive industry.

The book is informative, readable, well illustrated and, to a degree, provocative, and can be recommended to those interested in the subject. Useful lists of references, interested organizations, and plant manufacturers are provided in the appendix.

B.W.

Soil Biology. With special reference to the animal kingdom. WILHELM KÜHNELT. Translated by NORMAN WALKER. Faber and Faber. 45*s*.

Soil is the uppermost weathering layer of the earth's crust; it consists of broken up and chemically changed parent rock, together with the remains of plants and animals. In 1950 Professor Kuhnelt published the original German edition of this book and surveyed the part played by animals in this changing environment, as far as it was then known. In translating the revised edition Dr. Norman Walker has incorporated the results of the large amount of work published by many scientists in the field of soil biology since that date, with many original notes by Professor Kuhnelt himself.

Soil biology is a relatively new science and is therefore full of unsolved problems. This book, however, gives a clear and, for its size, reasonably comprehensive account of the groups of animals inhabiting the soil and the conditions under which they live. It goes on to examine the part they play in the maintenance of fertility. As such it forms an admirable and clear introduction to this aspect of soil science and should be read

with profit by anyone with a general or specialized interest in this subject.

An important part of the book is the "bibliography" which lists over 1,000 papers; these, however, appear to include only those mentioned in the text. The basis of this selection is rather difficult to follow and one wonders if some of the other 9,000 papers published on this subject might not have proved more informative. Also some classification of this bibliography would have been helpful. An index of organisms, mentioned in the text, is given, whereas one of the subjects discussed would have made it much easier to locate matter in the mass of very useful information given in this work.

J.H F.

Attack on Starvation. NORMAN W. DESROSIER. Avi Publishing Company. Westport, Connecticut, U.S.A. $7.50.

It is a remarkable tribute to American awareness of the world around them that this study of man and his food supplies should have come out of a country bedevilled by agricultural surpluses.

"Attack on Starvation" can be described as a primer on just this subject. In a simple and straightforward manner it sets out all the basic information on food needs, food production and starvation control. It is somewhat didactic in style; the book is no doubt designed chiefly to meet the needs of the students of Purdue University, as the summaries at the end of each chapter suggest. There are some remarkable glimpses of the obvious, sometimes combined with a strange style, at least to English ears, for instance (p. 3) "Starvation would not exist if diets contained at least the nutrient needs of man. This is not the case found". There is, moreover, at least one serious error (p. 23) where the author states that no two human beings possess exactly the same gene combinations, the more grave in that he is talking about identical twins in the next sentence. These twins may have different finger-prints, but they do have the same genes. There are also minor points on which it is not possible to agree with the author. For instance legume rotations being invented in the third century A.D., for these are mentioned in Pliny's "Natural History" in the first century.

However, in spite of all this, the book is remarkably useful as an introduction to the subject, provided the reader keeps an open mind. We follow the development of early and modern agricultures, note the world's agricultural resources, how soils are formed, deal with water, its use and cycle. We study the fisheries, the composition of food, its storage and distribution. All this is an introduction to the fourth section of the book, "World Starvation and its Control". This starts from the basic United Nations statement that two-thirds of the human race is underfed and that half the world's population lives on one-sixth of the world's land. An intriguing part of this is a glimpse of the food factory of the future, with presumably the abolition of agriculture, or a large part of it. This is the closed cycle food factory, where algae are grown in tanks and regularly pumped round past a light source, centrifuged off and fed to chickens, and much the same thing can be done with fish. Whether chickens would be as co-operative as fish remains to be seen, but one would be unwise to dismiss the scheme as impossible: it is the sort of thing that has a big appeal to the American technician.

The book is of value to those wanting a quick run-over of the subject and is of interest in showing that the U.S.A. is taking the world food situation seriously.

G.O.

Work Study on the Farm. A. A. PAKENHAM-WALSH. Pitman. 12*s.* 6*d.*

Work study is a difficult subject to write about, in that the principles and theory of it tend to be uninteresting. Yet no book on the subject is complete without some reference to them. In this book some of the more detailed principles are given very scant treatment. Farmers and advisers, for whom it is written, are usually more interested in examples and the results that work study can achieve, and, like many of its predecessors, the book uses poor material to illustrate the principles.

It is apparently written in the modern "Do-It-Yourself" idiom, and I find it rather difficult to understand how the author can omit such important facets of work study as multiple activity charts, which he calls "complicated", and yet go

on to deal in some detail with probably one of the most skilled parts of work measurement, i.e., rating and relaxation allowances.

At the outset the author decries the use of the recognized work study symbols and shows a distinct preference for the job analysis charts. This may be perfectly in order where the job is repetitive and one can always assume that tasks will follow in strict sequence. I am sure many experienced work study operators in agriculture would prefer to write the tasks down as they occur and at the same time insert any necessary symbols and times.

In the first half of the book an important part of method study, i.e., critical examination, is not given the detailed explanation which it merits, and too much attention is given to illustrating such points as graduated buckets, dipsticks, and the like.

In the section on work measurement, many skilled work study officers would find it extremely difficult to rate elements of over 10 minutes' duration; yet the author expects the novice to be able to do this with ease. The same would apply to the application of the various relaxation allowances.

On the credit side, the book has an extremely good chapter at the end on the extent of work study applications and the classification of manu-perpetual, manu-seasonal and agro-mechanical operations.

This book, like most of its predecessors, has failed to drive home the real advantages that work study can bring about on small and large farms alike. There is far too great a stress on the obvious, and one would not expect to see a section devoted to such things as the use of a hose-pipe, dipstick and cattle grids, in a book aimed at the practical man.

R.W.H.

Welsh Plant Breeding Station Report, 1960. 10*s*.

This report very fittingly includes a frontispiece in honour of the late Sir George Stapledon, the first Director of the Station, who died on the sixteenth September, 1960. The tribute to Sir George's greatness as a man and scientist is vivid, but a full appreciation of his life and work must await the publication of his biography.

The contribution of the report is invaluable, not only to the research worker but also to everyone concerned with the development of science in agricultural practice. The major developments in research work at the Station are pinpointed by the Director, Prof. P. T. Thomas. Studies in the nutritive value of herbage grasses indicate that appreciable genetic variation exists for leaf production both between and within grass varieties, and that under conditions of low light intensity differences in photosynthetic efficiency also become quite apparent. Considerable plant-to-plant variation has been found to exist, not only in digestibility but also in important constituents such as soluble carbohydrates, and the Station has developed a small animal nutrition unit to enable comparisons to be made with laboratory assessments for nutritive value. Much progress is being made in the breeding of new varieties of herbage for an extension of the grazing period by using plant material obtained from regions more southerly than the British Isles.

The Station's aims in its breeding programme are outlined, and each department's contribution in the chain of progress from the conceiving of ideas to the final production of new material for the farmer is well presented. Features of especial value to the breeder that have emerged during the year include the varietal differences found in the mineral content of cereals, the types of nutants produced in inbred populations of Yorkshire Fog, and the fact that resistance to Mildew in barley is governed by more than one gene. Projects already under way include a study to elucidate the effects of spacing and nutrition on flowering in herbage plants, the seeking of genetic resistance in spring oats to frit fly attack, the development of a rape variety with a genetic resistance to club root, and a study of clover phyllody virus.

The report also includes valuable conclusions of immediate practical importance to the farmer such as optimal management for lucerne, the place of S.170 tall fescue, rate of seeding for Marrow Stem kale and the relation between hardiness and density in Canson kale.

The report makes interesting reading. Its contents must be a source of pride to the Director of the Station and his staff, and it should have a forceful appeal to readers within a wide field of interest.

E.I.P.

Poultry Diseases under Modern Management. Poultry World Veterinary Adviser. Iliffe Books. 13*s.* 6*d.*

For many weeks, *Poultry World* published articles on the common diseases of poultry, written by their veterinary adviser. These articles have now been brought together and published as a small handbook for poultry keepers.

In the introduction, it is stated that special attention is given to "those diseases that constitute, or may be likely to constitute in the future, a source of real financial loss to the modern poultry farmer". The book, however, deals with most of the diseases of the domestic fowl, turkey and duck, placing special emphasis on prevention and control. The symptoms, post mortem lesions and treatment of the various diseases are also described.

The book is attractively bound and printed on good quality paper. There are a fair number of illustrations in the form of photographs, but these vary in quality and some seem rather pointless. On page 61 for example there is a photograph showing three chicks with infected yolk sacs compared with one normal chick, but if the caption did not state which chicks were affected, it would be impossible to guess. Apart from these minor criticisms, however, the book is difficult to fault.

The author, has dealt with a vast and complex subject in such a way that it can be easily understood by an intelligent layman, and the book should be of great value to poultry keepers and persons associated with the poultry industry.

I.F.K.

Electricity and Storage Brooders for Poultry Rearing and **Electricity and the Influence of Light upon Poultry Husbandry.** British Electrical Development Association.

These two new books on poultry husbandry will be of real interest and assistance to all concerned in poultry rearing. Electric heat storage brooding should be a valuable help to broiler growers and large-scale rearers who are concerned with the reduction of their production costs. The principles and methods of applying this technique are fully covered in *Electricity and Storage Brooders for Poultry Rearing.* Capital outlay and operating costs compare favourably with other methods, and the resulting economics can be considerable.

Electricity and the Influence of Light upon Poultry Husbandry gives reliable data and recommendations regarding light patterns to obtain larger eggs and higher production.

Both these publications can be obtained free from Electricity Boards or direct from EDA, 2 Savoy Hill, London, W.C.2.

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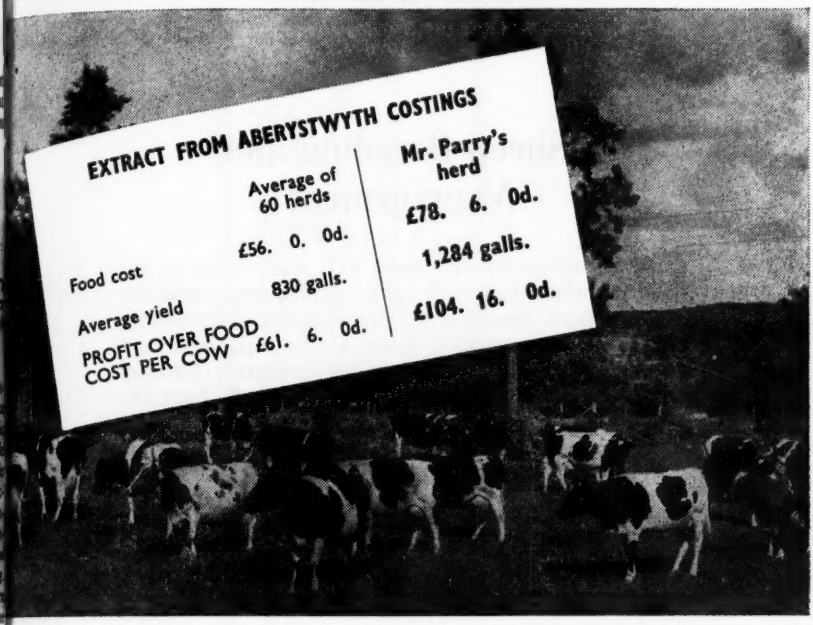

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